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Metal Concentrations in Fish and Sediment from Lakes near Flin Flon, Manitoba

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Central and Arctic Region
Department of Fisheries and Oceans
Winnipeg, Manitoba R3T 2N6

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AND SEDIMENT FROM LAKES
NEAR FLIN FLON, MANITOBA

by

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ABSTRACT

Harrison, S.E., M.D. Dutton, R.V. Hunt, J.F. Klaverkamp, A. Lutz, W.A. Macdonald, H.S. Majewski, and L.J. Wesson. 1989. Metal concentrations in fish and sediment from lakes near Flin Flon, Manitoba. Can. Data Rep. Fish. Aquat. Sci. 747: iv + 74 p.

Northern pike (*Esox lucius*), white suckers (*Catostomus commersoni*), and water were sampled in 1982 from thirteen lakes in Manitoba and Saskatchewan. Five lakes were within 8 km of Flin Flon, four were 23 to 43 km east of Flin Flon, and four were 68 to 84 km northwest of Flin Flon. Liver and skeletal muscle from 142 northern pike and 152 white sucker were analyzed for As, Cd, Cu, Hg, Pb, Se and Zn. Water samples were analyzed for Na, K, Ca, Mg, SO₄, Cl, pH, conductivity, dissolved inorganic carbon (DIC), dissolved organic carbon (DOC), NH₄-N, and NO₃-N. This report presents these chemical data as well as age, sex, length, weight, and condition factor of the fish sampled.

In 1985, sediment cores were taken from all 13 lakes, sectioned and analyzed for Zn, Cu, Cd, Hg, and Se content. Tables and plots of sediment metal profiles are provided for each lake. These data will be further evaluated and analyzed in a primary publication.

Key words: Zinc; copper; cadmium; mercury; selenium; lead; arsenic; sediment; fish.

RÉSUMÉ

Harrison, S.E., M.D. Dutton, R.V. Hunt, J.F. Klaverkamp, A. Lutz, W.A. Macdonald, H.S. Majewski, and L.J. Wesson. 1989. Metal concentrations in fish and sediment from lakes near Flin Flon, Manitoba. Can. Data Rep. Fish. Aquat. Sci. 747: iv + 74 p.

Des grands brochets (*Esox lucius*), des meuniers noirs (*Catostomus commersoni*), et des échantillons d'eau ont été prélevés en 1982 dans treize lacs du Manitoba et de la Saskatchewan. Cinq de ces lacs sont situés dans un rayon de 8 km de Flin Flon, quatre se situent de 23 à 43 km à l'est de Flin Flon et quatre se situent de 68 à 84 km au nord-ouest de Flin Flon. Des échantillons de foie et de muscles squelettiques provenant de 142 grands brochets et de 152 meuniers noirs ont été analysés pour détecter la présence d'As, de Cd, de Cu, de Hg, de Pb, de Se et de Zn. Les échantillons d'eau ont été analysés pour déterminer la teneur en Na, en K, en Ca, en Mg, en SO₄, et en Cl, de même que le pH, la conductivité et la teneur en carbone inorganique dissous (CID), en carbone organique dissous (COD), en NH₄-N et en NO₃-N. Le rapport

présente les données chimiques de même que l'âge, le sexe, la longueur, la masse et le coefficient de condition des poissons échantillonnés.

En 1985, des carottes de sédiments de chacun des lacs ont été prélevées, sectionnées et analysées pour déterminer la teneur en Zn, Cu, Cd, Hg et Se. Des tableaux et des graphiques décrivent la teneur en métaux des treize lacs.

Ces données feront l'objet d'études et d'analyses plus poussées dans le cadre d'un article à paraître dans une revue scientifique.

Mots-clés: zinc; cuivre; cadmium; mercure; sélénium; plomb; arsenic; sédiment; poisson.

INTRODUCTION

Since 1930, a base-metal smelter has been in operation in Flin Flon, Manitoba, which is located on the Manitoba-Saskatchewan border at approximately 55°N and 102°W (Fig. 1). From 1971 to 1980, this smelter milled and processed about 15 200 000 tonnes (t) of mixed sulfide ores producing approximately 544 000 t of copper, 640 000 t of zinc and 1 100 t of cadmium (Anon 1980). During this period, substantial amounts of gold (17 t), silver (327 t) and selenium (523 t) were produced as by-products of the milling, leaching and smelting processes.

Until 1974, emissions of sulfur oxides and metals were discharged to the atmosphere through two stacks (53 m and 69 m high). In 1974, one of these stacks was replaced by a taller stack approximately 250 m high. Since then, emissions have been discharged to the atmosphere largely from the taller stack. Precipitation collection and snow sampling demonstrated that these emissions are a major source of Cd, Zn, Cu, Pb and As input to lakes up to 284, 264, 60, 87 and 68 km, respectively, from the smelter (Franzin et al. 1979). In 1982, controls were installed which reduced particulate emissions by 85% (Fraser 1983).

Water, sediment, and macrophyte samples from lakes in the Flin Flon area contained elevated metal concentrations (Van Loon and Beamish 1977; Jackson 1978; McFarlane and Franzin 1978; McFarlane et al. 1979; Franzin and McFarlane 1980, 1981). A preliminary study on Cd, Cu and Hg levels in livers of white suckers and northern pike from five lakes close to the smelter described relationships between metal concentrations and fish age, but the limited data could not detect significant statistical relationships between metal concentrations in fish, and environmental variables, sediment metal concentration or metal deposition on lakes (McFarlane and Franzin 1980).

In 1982, we conducted a survey on lakes assumed to be within the deposition zone of the smelter (based on the estimates of Franzin et al. 1979), to determine levels of metal contamination in two fish species: the white sucker (*Catostomus commersoni*), a benthic feeder, and the northern pike (*Esox lucius*), a piscivore. Liver and skeletal muscle were analyzed for the metals Zn, Cu, Cd, Hg and Pb, and the semi-metals Se and As; lake water was analyzed for ionic composition. The survey was designed to evaluate factors such as, lake water chemistry, distance of lake from smelter, direction of prevailing winds, fish species, sex and age, which may affect metal contamination of these fish. The survey also evaluated the effect of installation of the taller stack on metal concentrations in fish (compared to data of McFarlane and Franzin 1980). In 1985, sediment cores were taken from each lake to assess the metal loading and metal loading chronology and to evaluate effects of the pollution control measures on metal concentrations in sediment. The data presented in this report will be further evaluated, analyzed, and presented in a primary publication.

METHODS

During July 1982, adult white suckers and northern pike were captured from 13 lakes. Five of these lakes 'Flin Flon Lakes' were located within an 8 km radius around the smelter (Fig. 1A). Four lakes 'Manitoba Lakes' were located 23 to 43 km east of the smelter (Fig. 1B). Four lakes 'Saskatchewan Lakes', were located 68 to 84 km northwest of the smelter (Fig. 1C).

Criteria for lake selection were road access, relatively small and consistent surface area, and presence of at least one of the fish species of interest. Topographical maps (1:50 000) and, when necessary, a planimeter were used to estimate lake surface area, location, distance and direction from the smelter.

Cliff Lake, the only 'Flin Flon Lake' located in Manitoba, is the domestic water source for the residents of Flin Flon and the industrial usage source for milling, leaching and smelting operations. Douglas Lake is the domestic water source for Creighton, Saskatchewan. A popular recreation area is located on the north end of Phantom Lake.

Fish were captured with overnight sets of gill nets, 230 to 280 m long, ranging between 50 and 110 mm stretched mesh. After removal from the nets, fish were placed on ice for transportation to a field laboratory near Flin Flon. Before dissection, the weight, fork length, and sex were recorded, and samples of pectoral fin, opercular bone, and scales were removed for age determination (Mills and Beamish 1980; Beamish 1981). Condition factor was calculated using the equation of Bagenal and Tesch (1978):

$$\text{Condition factor} = \frac{\text{Weight (g)} \times 10^5}{[\text{Fork length (mm)}]^3}$$

The entire liver and 50 to 80 g of skeletal muscle below the dorsal fin on the left side of the fish were removed, weighed, placed in small polyethylene bags, and frozen for transportation to the Metals Analysis Laboratory at the Freshwater Institute, Winnipeg, Manitoba.

In September, 1985, four sediment cores were taken from the deepest region of each lake (up to 18 m), with the exceptions of Phantom, Cliff and Saskatchewan #3 lakes. The deepest regions of these three lakes exceeded depths considered practical or safe for scuba diving. Scuba divers thrust acrylic plastic tubes 5 cm in diameter and 32.5 cm long into the bottom sediment, then plugged one end with a rubber stopper before removing the tube from the sediment and plugging the other end. Water above the core surface was removed before sectioning. The sediment cores were sectioned into 2, 2, 2, 2, 5, 5, and 5 cm slices in succession, from top to bottom, to a total depth of 25 cm. Each slice was placed in a plastic bag and frozen.

Muscle (4-6 g wet) and liver (0.5-1 g wet) samples were digested for analysis of Cd, Cu, Pb, and Zn with 5 mL conc. nitric acid and 1 mL conc. sulphuric acid in 25 X 200 mm test tubes

using an aluminum block heater at 130°C. Charring of any organic residues commences following the evaporation of the nitric acid. Hydrogen peroxide (50%) was added by drops until the solution was clear. The heating, charring, and peroxide addition was repeated until no further charring occurred.

The total sample volume was then brought up to 25 mL with distilled-deionized water. Muscle samples were further treated by an extraction and concentration process for analyses of Cd, Cu and Pb. This process consisted of adding 3 mL of diethyl ammonium diethyl dithiocarbamate (DDDC; 0.5%) in butyl acetate, mixing in a vortex for 30 s, then removing and centrifuging the butyl acetate layer for 5 min (Kinrade and Van Loon 1974).

Mercury analyses of the tissues were performed as described by Armstrong and Uthe (1971). Arsenic and selenium were analyzed using the methods of Vijan and Wood (1974).

Sediment samples were oven-dried at 80°C and a 0.5 g subsample was ground with a glass mortar and pestle, followed by a nitric, perchloric, hydrofluoric acid digestion, following the methods of Sturgeon et al. (1982). Concentrations of Pb and As were not determined in sediment samples.

A Varian AA-5 atomic absorption spectrophotometer equipped with a BC-6 simultaneous background corrector was used for metal and trace element determinations. Detection limits were as shown in Table 3.

Water samples for analyses of Na, K, Ca, Mg, SO₄, Cl, pH and conductivity were collected in July, 1982, at a depth of 1 m, with a Van Dorn apparatus. Because Naosap Mud Lake is very shallow, its water sample was taken at a depth of 0.5 m. At the field laboratory, a sample of this water was allowed to equilibrate until a constant pH (steady for at least 30 s) was recorded (8 to 10 minutes). A Fisher Model 119 field pH meter, calibrated with reference buffers between each sample was used to measure pH. Samples for dissolved inorganic carbon (DIC) and dissolved organic carbon (DOC) were collected at arm's length depth in 50 mL polypropylene syringes. Individual samples for NH₄-N and NO₃-N were collected in glass vials. Sample collection procedures and analytical methodologies are described in Stainton et al. (1977).

Alkalinity was calculated using an equation described by Schindler et al. (1980):

$$\text{Alkalinity } (\mu\text{Eq}\cdot\text{L}^{-1}) = (\text{Na}^+) + (\text{K}^+) + (\text{Ca}^{2+}) + (\text{Fe}^{2+}) + (\text{Mn}^{2+}) + (\text{Mg}^{2+}) - (\text{Cl}^-) - (\text{SO}_4^{2-}) - (\text{NO}_3^-)$$

Mn and Fe were not analyzed and included in the calculations because they are present only in the low $\mu\text{M}\cdot\text{L}^{-1}$ range (McFarlane et al. 1979). The concentrations of NO₃ were frequently found to be below detection limits and therefore were not included in the calculations.

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Table 1. Surface area and location of study lakes.

Region	Lake	Location	Area (ha)	Distance (km) from smelter	Direction from smelter
FLIN FLON	HAMELL LAKE	54°48'N 101°57'W	233	4	NW
	DOUGLAS LAKE	54°44'N 101°56'W	122	5	SW
	PHANTOM LAKE	54°43'N 101°52'W	478	5	S
	CLIFF LAKE	54°48'N 101°51'W	246	6	N
	MERIDIAN LAKE	54°44'N 101°59'W	123	8	W
MANITOBA	CLEAVER LAKE	54°43'N 101°33'W	58	23	SE
	NAOSAP MUD LAKE	54°51'N 101°29'W	58	27	NE
	KOTYK LAKE	54°53'N 101°29'W	127	30	NE
	NEKIK LAKE	54°56'N 101°16'W	187	43	NE
SASKATCHEWAN	SASK LAKE NO. 1	55°02'N 102°49'W	35	68	NW
	SASK LAKE NO. 2	55°05'N 102°53'W	57	74	NW
	SASK LAKE NO. 4	55°22'N 102°40'W	25	83	NW
	SASK LAKE NO. 3	55°13'N 102°55'W	128	84	NW

Table 2. Water chemistry parameters of study lakes.

Lake	Na $\mu\text{mol}\cdot\text{L}^{-1}$	K $\mu\text{mol}\cdot\text{L}^{-1}$	Ca $\mu\text{mol}\cdot\text{L}^{-1}$	Mg $\mu\text{mol}\cdot\text{L}^{-1}$	SO_4 $\mu\text{mol}\cdot\text{L}^{-1}$	Cl $\mu\text{mol}\cdot\text{L}^{-1}$	Alkalinity $\mu\text{equiv}\cdot\text{L}^{-1}$	pH	Conductivity $\mu\text{S}\cdot\text{cm}^{-1}$	DIC $\mu\text{mol}\cdot\text{L}^{-1}$	DOC $\mu\text{mol}\cdot\text{L}^{-1}$	$\text{NH}_4\text{-N}$ $\mu\text{mol}\cdot\text{L}^{-1}$	$\text{NO}_3\text{-N}$ $\mu\text{mol}\cdot\text{L}^{-1}$
HANELL LAKE	70.5	35.5	384.2	118.0	152.0	90.3	716.3	7.54	110	660	670	1.7	<0.016
DOUGLAS LAKE	104.8	39.1	598.8	177.7	164.5	158.0	1209.9	8.35	170	1160	630	3.3	<0.016
PHANTOM LAKE	154.0	49.6	546.4	237.7	156.1	90.3	1369.3	8.50	170	1210	630	1.1	<0.016
CLIFF LAKE	74.4	32.2	374.3	149.7	154.1	39.5	806.9	7.72	120	790	600	1.1	<0.016
MERIDIAN LAKE	53.9	24.8	234.0	86.2	133.2	22.6	430.1	7.56	70	430	1440	2.2	<0.016
CLEAVER LAKE	85.7	20.5	262.0	146.0	68.7	70.5	714.3	6.98	80	700	460	2.2	<0.016
NAOSAP MUD LAKE	67.0	24.8	401.7	88.0	71.8	14.1	913.4	7.60	100	880	940	2.8	0.032
KOTYK LAKE	57.9	16.4	190.1	69.9	56.2	16.9	465.0	7.40	60	430	1010	2.8	<0.016
NEKIK LAKE	73.9	19.9	162.4	74.0	52.0	16.9	445.8	7.35	50	410	1030	2.2	<0.016
SASK LAKE NO. 1	94.0	31.7	157.7	147.7	53.1	19.7	610.5	6.50	70	580	710	3.3	0.016
SASK LAKE NO. 2	53.9	15.9	81.1	53.9	57.3	5.6	219.7	6.14	30	220	750	2.8	<0.016
SASK LAKE NO. 3	84.0	31.7	104.3	77.7	70.8	16.9	321.3	5.88	50	300	1120	2.2	<0.016
SASK LAKE NO. 4	60.9	19.9	76.5	82.1	66.6	11.3	213.7	5.85	30	220	440	2.2	0.048

Table 3. Detection limits in tissues and sediments.

	Muscle	Liver	Sediment
As and Se	< 0.05	< 0.05	< 0.1 **
Cd	< 0.01 *	< 0.05 *	< 1
Cu	< 0.01 *	< 0.5	< 2.5
Pb	< 0.02 *	< 0.1 *	**
Zn	< 0.05	< 0.3	< 1
Hg	< 0.01	< 0.01	< 0.01

* Diethyl ammonium diethyl dithiocarbamate extraction

** [Pb] and [As] not determined in sediments

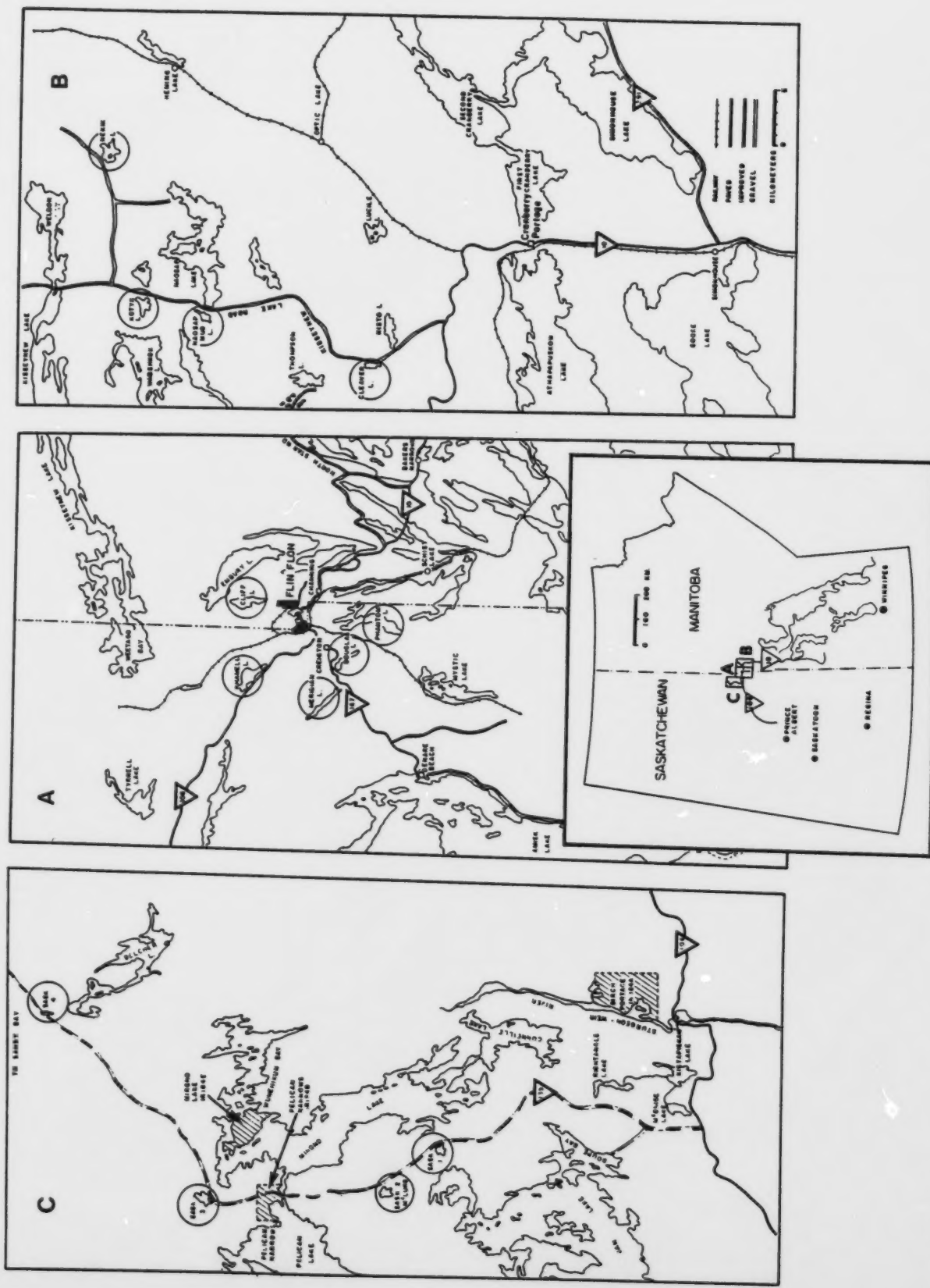


Fig. 1. A map showing the geographical location of the study lakes.

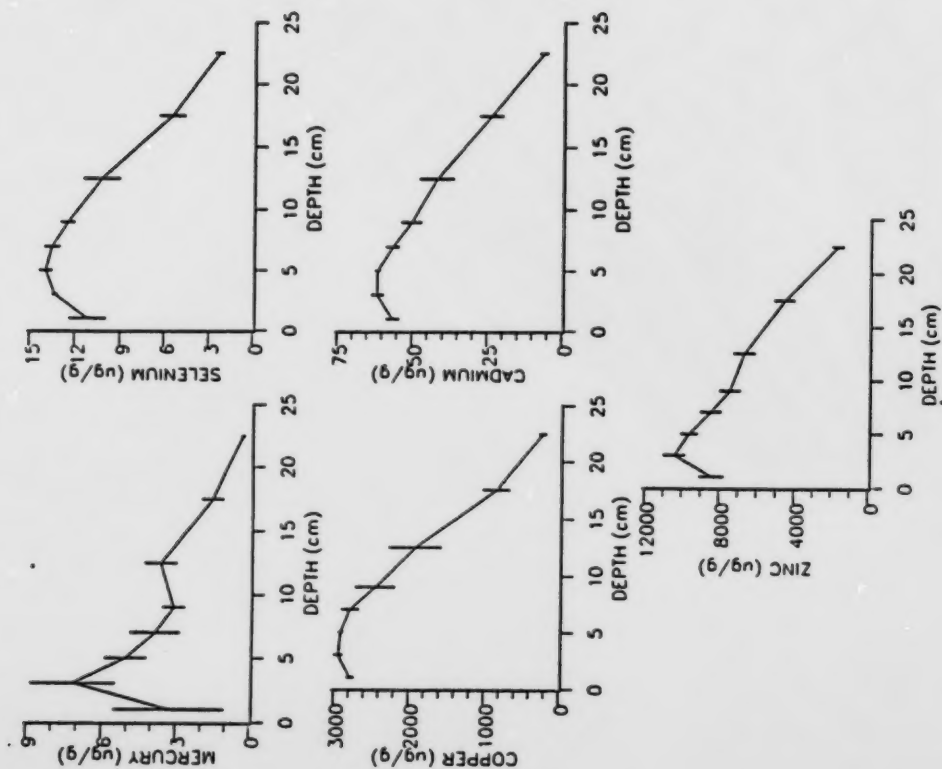


Fig. 2 (a). Sediment metal profiles (mean, SE, of 4 cores) for Hamell Lake.

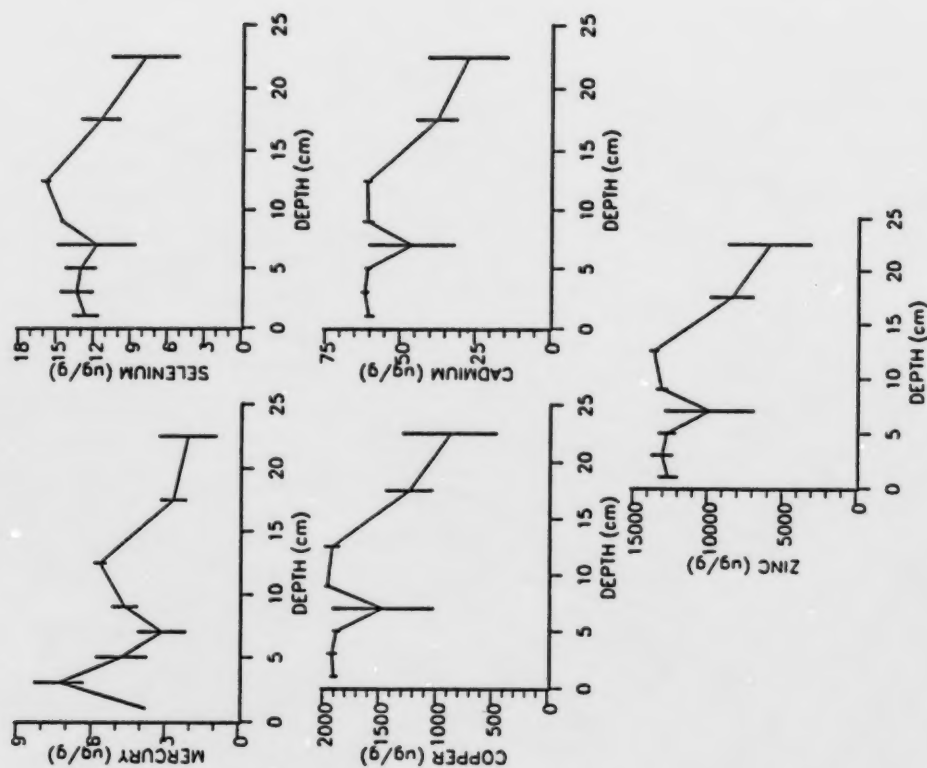


Fig. 2 (b). Sediment metal profiles (mean, SE, of 4 cores) for Douglas Lake.

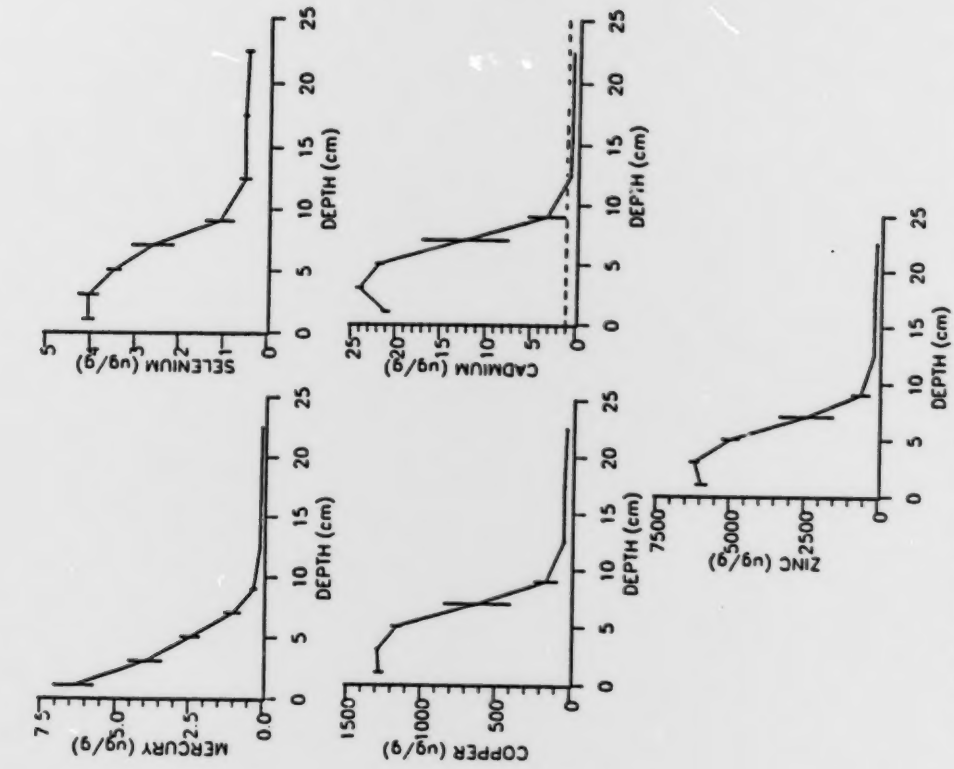


Fig. 2 (d). Sediment metal profiles (mean, SE, of 4 cores) for Cliff Lake. The dotted line indicates the detection limit for cadmium.

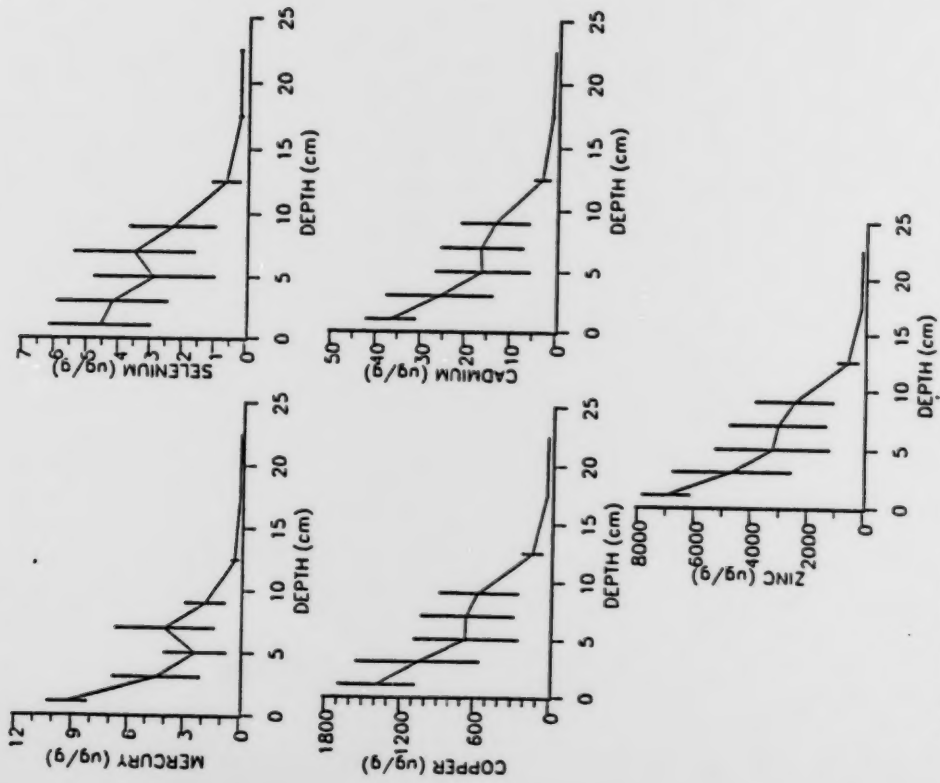


Fig. 2 (c). Sediment metal profiles (mean, SE, of 4 cores) for Phantom Lake.

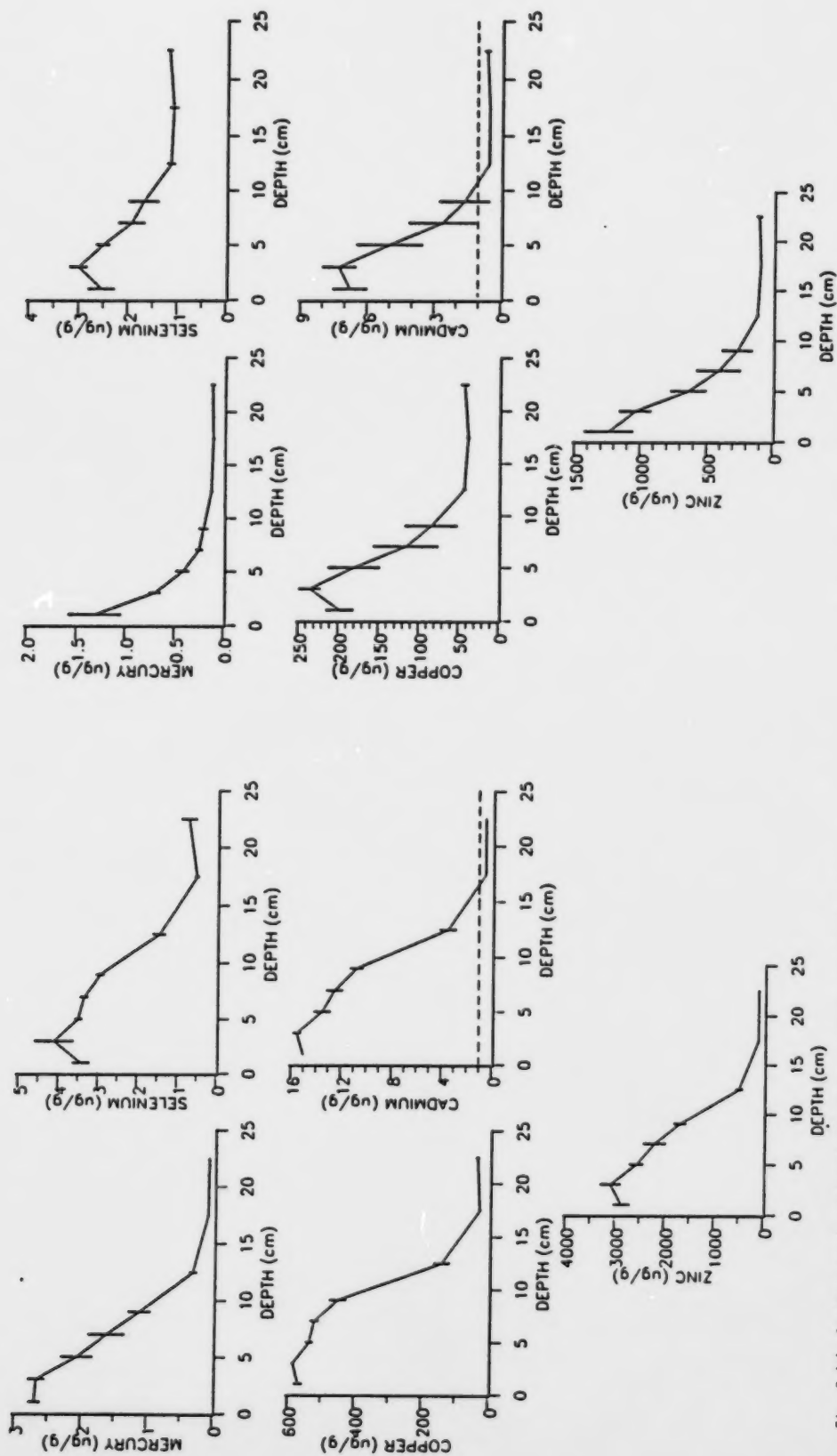


Fig. 2 (f). Sediment metal profiles (mean, SE, of 4 cores) for Cleaver Lake. The dotted line indicates the detection limit for cadmium.

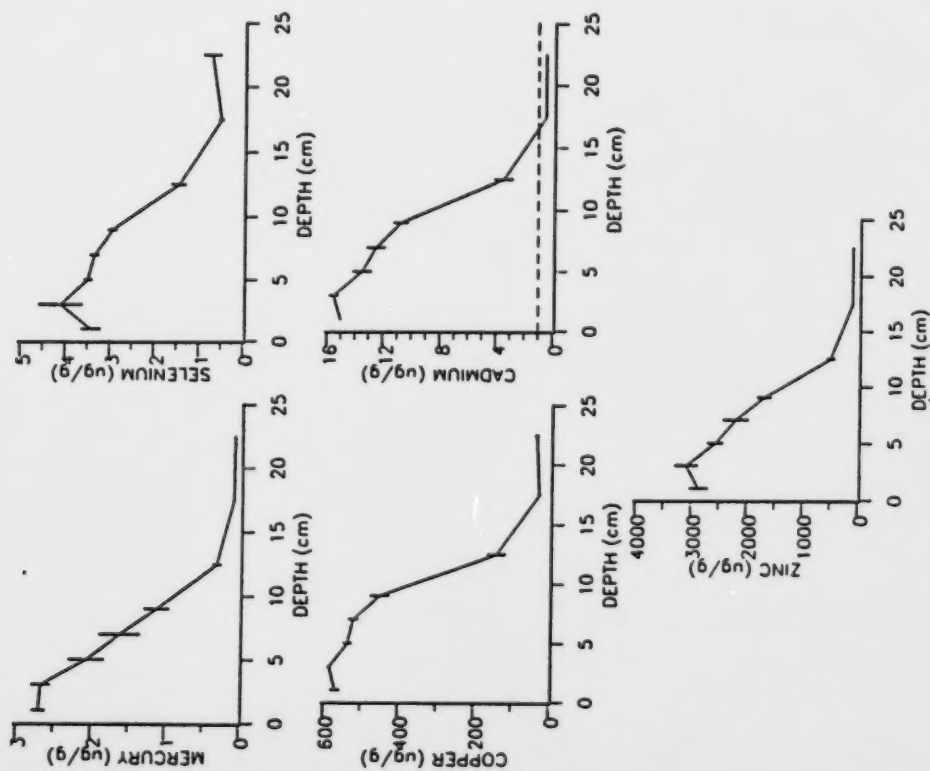


Fig. 2 (e). Sediment metal profiles (mean, SE, of 4 cores) for Meridian Lake. The dotted line indicates the detection limit for cadmium.

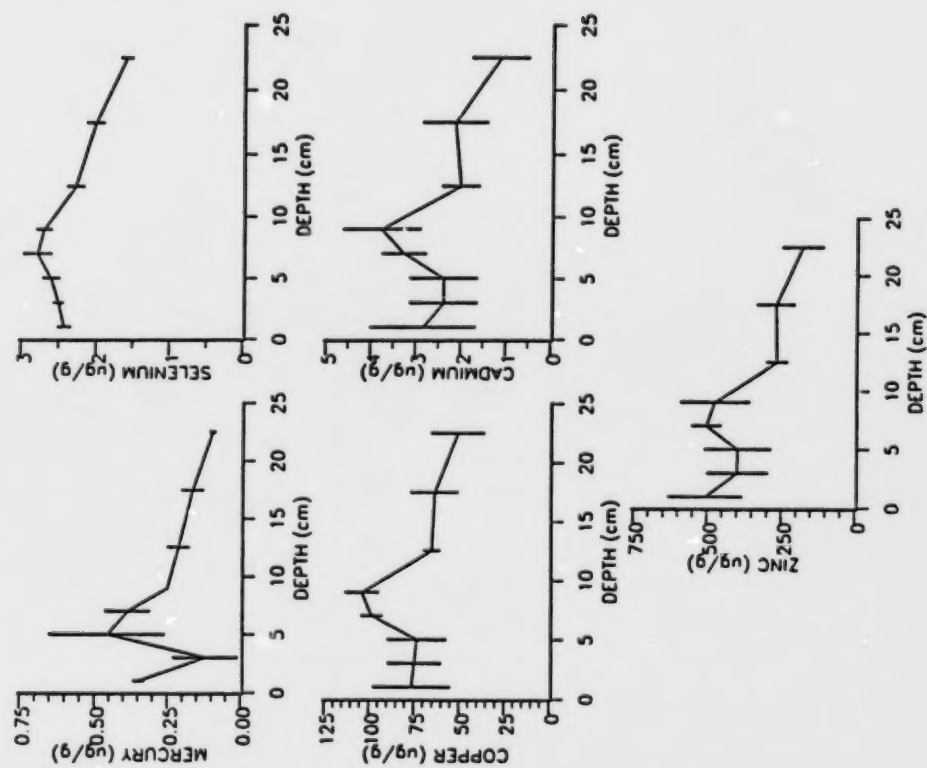


Fig. 2 (h). Sediment metal profiles (mean, SE, of 4 cores) for Kotyk Lake.

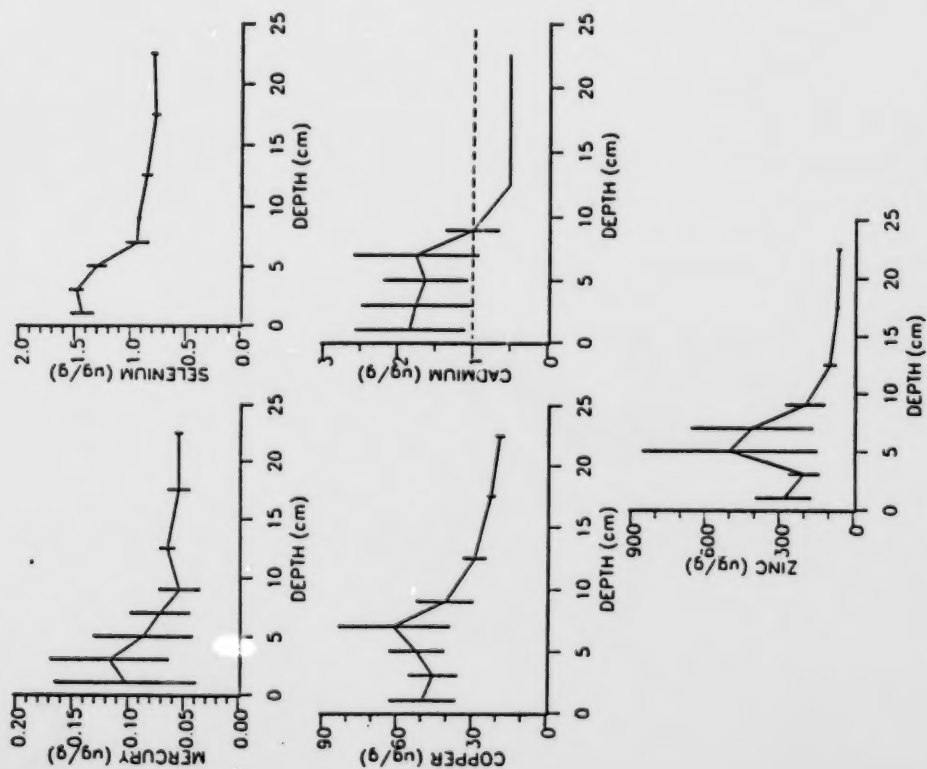


Fig. 2 (g). Sediment metal profiles (mean, SE, of 4 cores) for Maosap Mud Lake. The dotted line indicates the detection limit for cadmium.

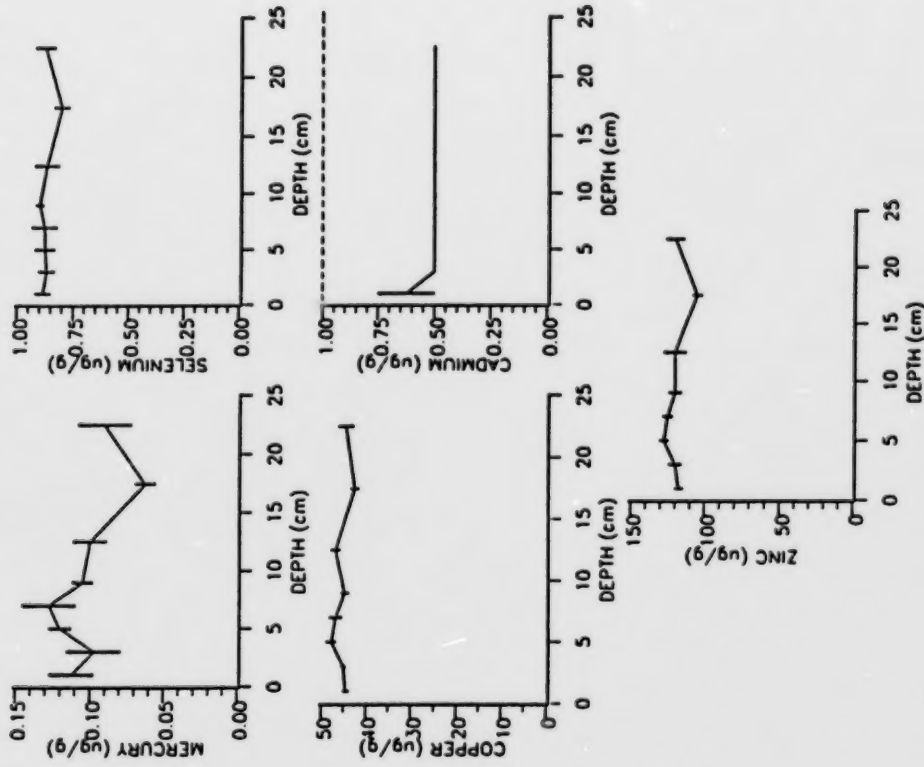


Fig. 2 (j). Sediment metal profiles (mean, SE, of 4 cores) for Saskatchewan #1 Lake. The dotted line indicates the detection limit for cadmium.

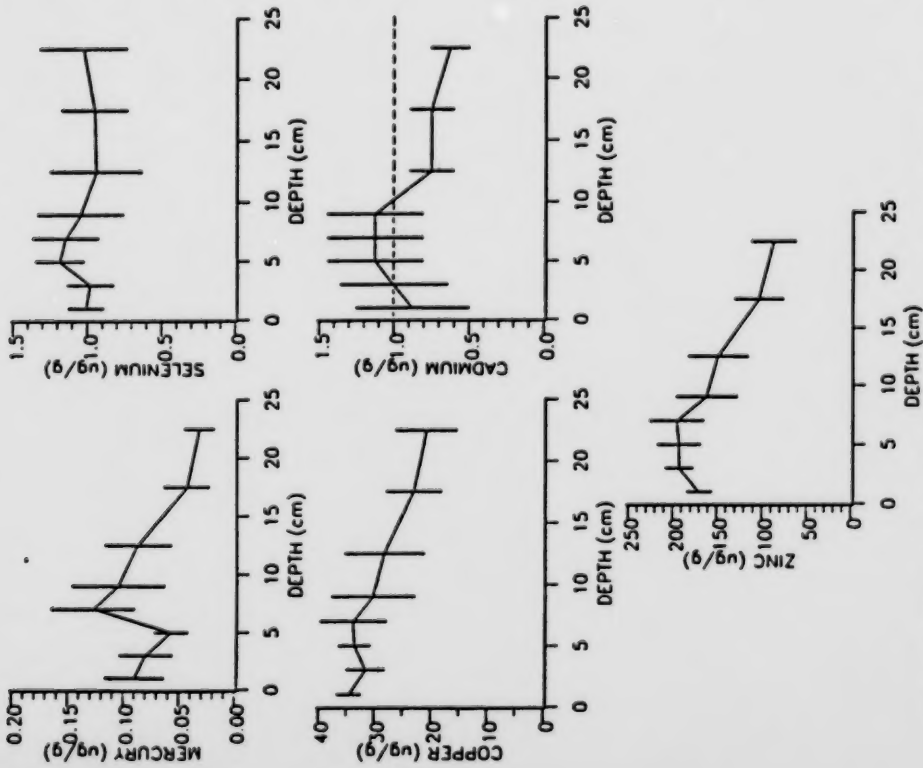


Fig. 2 (i). Sediment metal profiles (mean, SE, of 4 cores) for Melik Lake. The dotted line indicates the detection limit for cadmium.

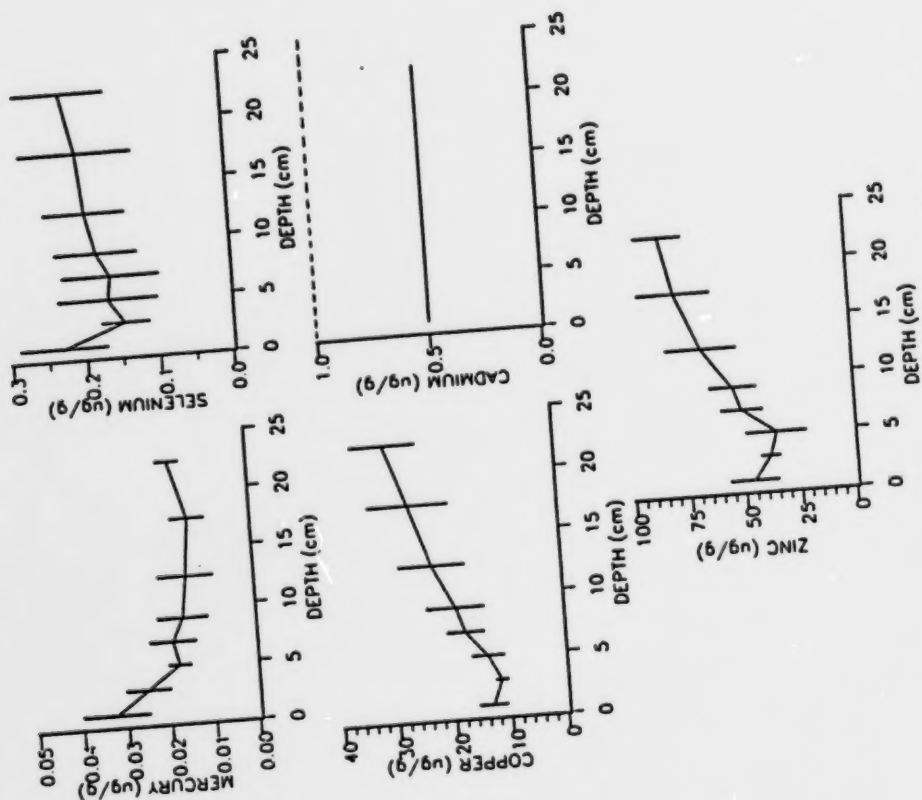


Fig. 2 (1). Sediment metal profiles (mean, SE, of 3 cores) for Saskatchewan #3 Lake. The dotted line indicates the detection limit for cadmium.

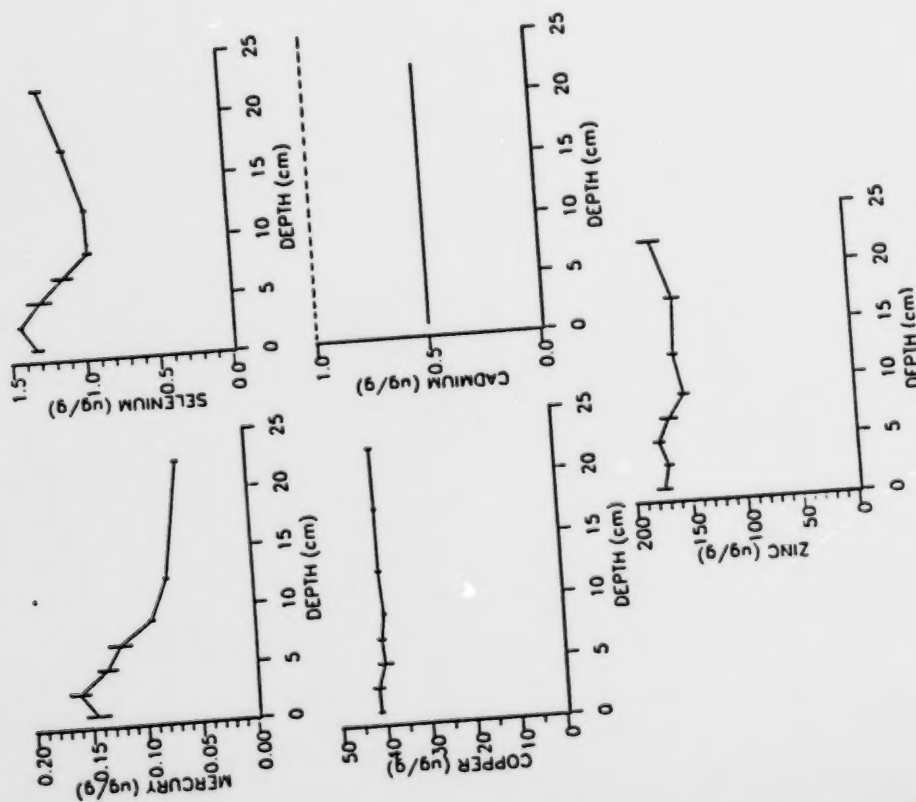


Fig. 2 (2). Sediment metal profiles (mean, SE, of 4 cores) for Saskatchewan #2 Lake. The dotted line indicates the detection limit for cadmium.

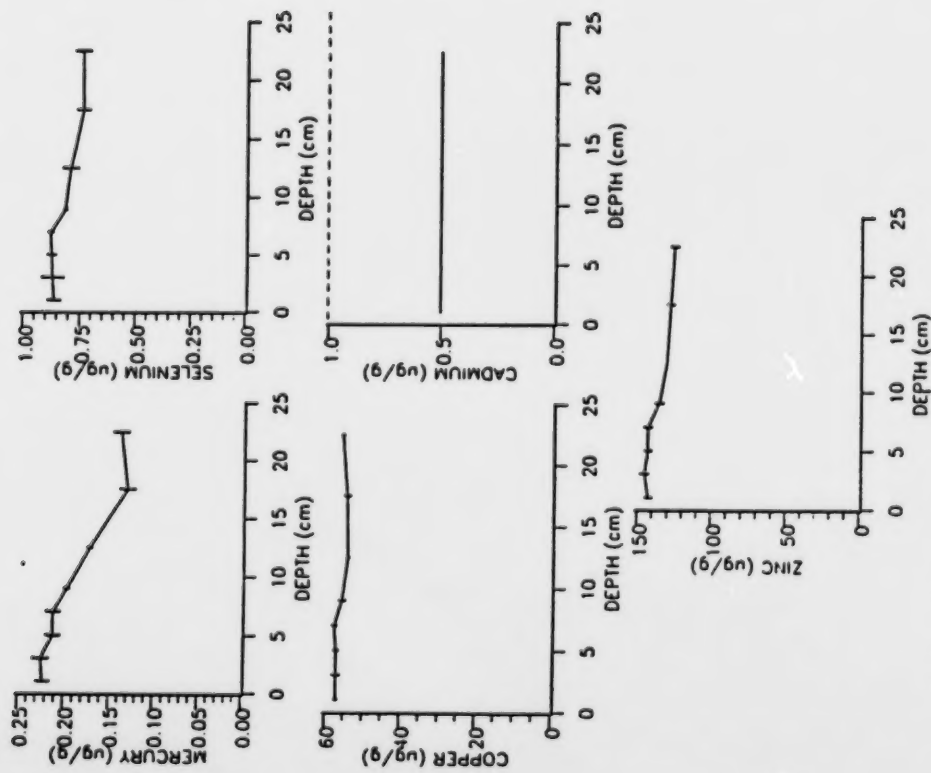


Fig. 2 (m). Sediment metal profiles (mean, SE, of 4 cores) for Saskatchewan #4 Lake. The dotted line indicates the detection limit for cadmium.

Appendix 1.

Metal concentrations in sediment core samples from the study lakes.

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION-PLIN FLOW				DISTANCE (km) FROM SMELTER-4				LAKE-HAMELL LAKE			
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H ₂ O	% WEIGHT LOSS ON IGNITION			
1	0-2	7390	2710	51	5.49	9.61	97.3	52.15			
	2-4	10200	2860	61	7.18	13.2	96.8	51.90			
	4-6	9410	2980	62	4.22	14.6	96.2	52.17			
	6-8	8860	2470	50	1.01	13.8	96.5	53.61			
	8-10	6420	1690	41	1.94	11.7	96.4	54.98			
	10-15	5390	940	26	1.77	6.86	96.2	55.77			
	15-20	3280	360	13	0.44	3.29	96.0	56.52			
	20-25	1140	120	3	0.22	1.80	95.6	56.13			
	0-2	9620	2860	60	1.05	14.4	97.4	51.93			
	2-4	11800	3080	63		13.4	96.9	51.60			
2	4-6	8530	2890	59		14.6	96.6	53.41			
	6-8	9040	2810	58	4.64	14.2	96.7	53.31			
	8-10	8740	2640	52	3.02	12.7	96.1	53.95			
	10-15	8050	2480	50	4.50	12.3	96.2	53.61			
	15-20	4160	820	23	1.37	5.48	95.8	57.32			
	20-25	1680	200	6	0.20	1.06	95.5	58.26			
	0-2	7200	2890	55		9.28	97.6	53.14			
	2-4	9050	2860	56	10.0	13.0	97.0	52.52			
	4-6	10800	2920	62	6.68	13.3	96.5	53.07			
	6-8	9060	3000	59	5.40	14.1	96.4	53.05			
3	8-10	7850	2870	56	3.78	13.6	96.2	53.50			
	10-15	6670	2230	48	4.11	11.5	95.8	54.55			
	15-20	5580	1090	30	2.19	7.36	95.6	56.84			
	20-25	2410	300	9	0.40	2.6	95.4	57.94			
	0-2	9420	2820	59		11.3	97.3	53.44			
	2-4	10500	2950	65	4.24	13.6	96.6	53.08			
4	0-2	7390	2710	51	5.49	9.61	97.3	52.15			
	2-4	10200	2860	61	7.18	13.2	96.8	51.90			
	4-6	9410	2980	62	4.22	14.6	96.2	52.17			
	6-8	8860	2470	50	1.01	13.8	96.5	53.61			
	8-10	6420	1690	41	1.94	11.7	96.4	54.98			
	10-15	5390	940	26	1.77	6.86	96.2	55.77			
	15-20	3280	360	13	0.44	3.29	96.0	56.52			
	20-25	1140	120	3	0.22	1.80	95.6	56.13			
	0-2	9620	2860	60	1.05	14.4	97.4	51.93			
	2-4	11800	3080	63		13.4	96.9	51.60			

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

----- REGION=FLIN FLOM DISTANCE (km) FROM SMELTER=4 LAKE=HAMELL LAKE -----									
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION	
4	4-6	10000	2850	62	4.20	13.1	96.6	53.78	
	6-8	8840	2860	58	4.33	12.1	96.3	53.92	
	8-10	6620	2600	51	3.67	11.8	96.1	55.02	
	10-15	6440	2020	43	4.10	10.2	95.7	55.52	
	15-20	5100	1100	29	2.22	5.83	95.6	58.18	
	20-25	1400	290	7	0.43	2.93	95.6	57.90	

REGION=FLIN FLOM				DISTANCE (km) FROM SMELTER=5			LAKE=DOUGLAS LAKE	
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION
1	0-2	11000	1880	56		9.77	97.2	66.30
	2-4	11000	1920	58	6.30	9.58	96.8	65.65
	4-6	11000	1900	58	5.94	9.49	96.9	65.86
	6-8	12000	1960	57	4.36	15.6	96.8	65.70
	8-10	12000	1960	56	5.60	14.7	96.7	66.51
	10-15	13000	1890	57	6.26	16.8	96.3	65.07
	15-20	5950	890	26	1.78	7.83	96.2	70.88
	20-25	400	94	2	0.14	2.07	96.8	77.19
2	0-2	12300	1830	60		12.8	97.1	62.71
	2-4	13600	1880	62		15.2	96.9	63.63
	4-6	13100	1800	62	6.72	14.3	96.7	63.71
	6-8	13100	1880	62	3.96	14.7	96.4	63.84
	8-10	13200	1900	60	4.10	14.5	96.8	64.44
	10-15	13400	1870	62	5.59	15.6	96.4	63.78
	15-20	12500	1820	57	4.09	15.3	96.0	64.35
	20-25	7560	1150	36	2.29	10.9	96.0	69.47

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

CORE	SECTION (cm)	REGION=FLIN FLOW		DISTANCE (km) FROM SHELTER-5		LAKE-DOUGLAS LAKE		% WEIGHT LOSS ON IGNITION
		ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	
3	0-2	13400	1930	62		13.9	97.1	65.25
	2-4	13200	1830	62	8.23	13.9	96.7	64.79
	4-6	13200	1930	61	2.11	13.4	96.7	65.55
	6-8	13300	1890	61	3.91	14.3	96.6	65.10
	8-10	13600	1990	64	4.12	14.1	96.4	65.84
	10-15	14100	1800	62	5.35	15.2	96.2	64.33
	15-20	7280	1160	36	2.60	10.4	95.7	70.17
	20-25	12800	1910	61	5.25	13.8	96.4	65.91
	0-2	13800	1980	62	3.77	13.9	97.0	64.60
	2-4	14300	2030	64		14.6		63.99
4	4-6	13500	1880	61	4.24	14.8	96.6	65.18
	6-8	980	130	4	0.24	2.32	96.5	78.00
	8-10	13400	1990	62		14.6	96.6	64.93
	10-15	13800	2100	62	5.26	15.6	96.3	64.54
	15-20	7690	1070	33	2.22	12.2	96.1	70.76
	20-25	2600	340	11	0.63	4.39	96.5	76.43

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=FLIN FLON DISTANCE (km) FROM SMELTER=5 LAKE=PHANTOM LAKE									
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION	
1	0-2	5640	910	29	11.7	0.98	38.5	5.91	
	2-4	1520	260	7	0.42	1.95	25.9	3.59	
	4-6	220	46	<1	0.08	0.15	38.4	2.49	
	6-8	100	36	<1	0.04	0.43	39.9	2.17	
	8-10	100	37	<1	0.10	<0.10	40.6	1.97	
	10-15	99	37	<1	0.04	<0.10	45.8	2.06	
	15-20	100	36	<1	0.04	0.11	52.5	2.61	
	20-25	100	34	<1	0.02	0.10	49.3	2.52	
	0-2	5630	840	26	8.85	4.53	36.5	11.20	
	2-4	550	110	3	0.56	0.54	34.0	3.32	
2	4-6	120	40	<1	0.04	<0.10	48.3	2.63	
	6-8	99	34	<1	0.03	<0.10	47.9	2.75	
	8-10	100	34	<1	0.03	<0.0	51.2	2.81	
	10-15	93	33	<1	0.03	<0.10	48.1	2.46	
	15-20	87	31	<1	0.03	<0.10	42.7	2.43	
	20-25	71	26	<1	0.02	0.15	35.2	2.05	
	0-2	7560	1690	41	6.78	4.00	89.1	16.24	
	2-4	8160	1880	44	7.36	6.38	86.1	16.09	
	4-6	3810	740	18	2.33	3.12	70.2	6.18	
	6-8	5180	1000	28	11.20	6.18	57.7	8.30	
3	8-10	4190	880	22	3.84	3.52	43.9	8.00	
	10-15	390	110	3	0.22	0.51	28.5	3.26	
	15-20	42	13	2	0.03	0.17	56.7	4.67	
	20-25	36	10	<1	0.03	0.15	52.3	3.88	
	0-2	9120	2100	50	9.73	8.67	93.2	25.15	
	2-4	8410	1950	48	9.48	7.76	90.0	22.27	
4	0-2	5640	910	29	11.7	0.98	38.5	5.91	
	2-4	1520	260	7	0.42	1.95	25.9	3.59	
	4-6	220	46	<1	0.08	0.15	38.4	2.49	
	6-8	100	36	<1	0.04	0.43	39.9	2.17	
	8-10	100	37	<1	0.10	<0.10	40.6	1.97	
	10-15	99	37	<1	0.04	<0.10	45.8	2.06	
	15-20	100	36	<1	0.04	0.11	52.5	2.61	
	20-25	100	34	<1	0.02	0.10	49.3	2.52	
	0-2	5630	840	26	8.85	4.53	36.5	11.20	
	2-4	550	110	3	0.56	0.54	34.0	3.32	

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=FLIN FLON							LAKE=PHANTOM LAKE						
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION					
4	4-6	8720	1820	45	7.03	8.12	88.6	20.96					
	6-8	8700	1550	36	4.80	7.28	86.6	19.38					
	8-10	5400	1310	30	3.51	5.54	83.0	17.23					
	10-15	1830	370	8	0.88	1.90	77.7	11.52					
	15-20	130	34	<1	0.11	0.42	86.3	6.28					
	20-25	86	23	<1	0.06	0.33	87.2	7.81					

REGION=FLIN FLON							LAKE=CLIFF LAKE						
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION					
1	0-2	5480	1190	20	5.06	3.93	89.6	14.22					
	2-4	6120	1280	25	3.82	4.33	84.3	13.22					
	4-6	5710	1160	23	2.55	3.71	81.8	12.85					
	6-8	4840	1200	25	1.79	3.46	79.4	12.13					
	8-10	1460	360	9	0.62	1.94	74.6	9.97					
	10-15	150	38	<1	0.09	0.46	88.7	8.51					
	15-20	160	46	<1	0.07	0.56	72.9	10.34					
	20-25	110	33	<1	0.04	0.42	89.9	8.79					
	0-2	6310	1320	22	6.61	4.33	90.5	15.16					
	2-4	6590	1320	24	3.67	3.84	86.0	13.95					
2	4-6	4800	1240	22	1.85	3.42	82.7	13.40					
	6-8	2720	740	14	0.96	3.32	80.3	12.78					
	8-10	490	150	3	0.26	1.20	78.2	11.81					
	10-15	220	72	1	0.14	0.85	75.3	10.75					
	15-20	220	66	<1	0.09	0.57	72.8	9.88					
	20-25	140	45	<1	0.09	0.67	75.4	11.90					

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

CORE		REGION=FLIN FLON				DISTANCE (km) FROM SWELTER=6				LAKE=CLIFF LAKE				% WEIGHT LOSS ON IGNITION
SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O								
3	0-2	5810	1310	21	5.77	4.12	88.5				13.78			
	2-4	6160	1270	24	2.85	4.46	83.3				12.84			
	4-6	4340	1110	21	2.13	3.07	80.3				12.22			
	6-8	1040	260	5	0.67	1.79	75.1				9.70			
	8-10	260	68	<1	0.17	0.65	69.6				8.23			
	10-15	110	29	<1	0.07	0.33	65.0				6.96			
	15-20	97	29	<1	0.06	0.34	69.5				8.80			
	20-25	70	21	<1	0.03	0.27	63.1				6.78			
	0-2	6190	1290	21	8.11	3.76	90.8				15.41			
	2-4	5890	1270	23	5.54	3.52	86.0				14.36			
4	4-6	5000	1100	21	3.29	3.68	83.2				13.61			
	6-8	1100	280	5	0.68	1.77	77.7				11.20			
	8-10	170	53	<1	0.17	0.56	73.6				11.42			
	10-15	140	39	<1	0.08	0.39	70.6				9.99			
	15-20	120	37	<1	0.08	0.59	73.6				9.10			
	20-25	100	35	<1	0.08	0.42	73.5				10.82			

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=FLIN FLOD DISTANCE (km) FROM SMELTER=8 LAKE=MERIDIAN LAKE							% WEIGHT LOSS ON IGNITION	
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H ₂ O	
1	0-2	2980	580	15	2.53	4.01	92.3	25.34
	2-4	3370	580	16	2.73	5.51	90.8	25.02
	4-6	2620	520	12	1.68	3.72	88.8	23.66
	6-8	1860	510	11	1.07	3.36	86.5	23.07
	8-10	1550	400	10	0.80	2.66	84.6	21.84
	10-15	350	91	2	0.20	1.12	80.8	21.08
	15-20	110	30	<1	0.09	0.38	73.8	16.78
	20-25	95	33	<1	0.07	0.59	78.5	19.42
	25-30	87	33	<1	0.05	0.32	67.0	9.80
	30-35	96	41	<1	0.05	<0.10	42.1	2.95
2	0-2	2630	540	15	2.79	3.10	92.0	25.19
	2-4	2760	580	15	2.85	3.65	90.2	24.77
	4-6	2700	530	14	2.66	3.49	89.3	24.66
	6-8	2640	540	14	2.18	3.48	87.3	24.18
	8-10	1760	430	11	1.40	3.02	84.0	23.91
	10-15	420	120	3	0.26	1.33	80.8	22.08
	15-20	84	23	<1	0.08	0.49	72.0	15.47
	20-25	120	44	<1	0.08	1.14	80.9	19.78
	25-30	86	33	<1	0.06	0.33	56.8	5.41
	30-35	99	41	<1	0.03	0.12	40.4	2.18
3	0-2	3260	590	15	2.58	3.32	92.3	26.18
	2-4	3480	590	16	2.32	3.60	90.1	25.36
	4-6	2160	520	13	1.73	3.45	88.5	24.81
	6-8	1780	490	12	1.24	3.09	87.0	24.66
	8-10	1450	460	10	0.89	3.00	85.7	23.83
	10-15	530	150	4	0.34	1.55	81.9	22.10

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=FLIN FLON							LAKE=MERIDIAN LAKE			
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION		
3	15-20	130	33	<1	0.10	0.60	75.6	16.45		
	20-25	83	25	<1	0.06	0.27	72.7	16.36		
	0-2	2580	560	15	2.67	3.25	92.1	25.04		
	2-4	2710		15	2.76	3.59	89.7	24.06		
4	4-6	2740	540	15	2.18	3.29	88.5	23.33		
	6-8	2490	540	13	1.97	3.42	87.1	23.21		
	8-10	1960	510	12	1.38	3.06	84.9	22.44		
	10-15	650	200	5	0.45	1.80	80.8	21.17		
	15-20	89	24	<1	0.07	0.56	71.6	14.81		
	20-25	110	39	<1	0.08	0.87	78.0	17.73		

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REGION=MANITOBA							LAKE=CLEAVE LAKE			
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION		
1	0-2	940	160	6	1.99	2.26	94.9	47.27		
	2-4	920	210	6	0.59	2.82	93.5	46.78		
	4-6	410	120	2	0.33	2.30	93.5	47.02		
	6-8	250	73	1	0.23	1.55	93.0	47.77		
	8-10	140	50	<1	0.16	1.42	96.7	48.60		
	10-15	130	43	<1	0.14	1.20	83.4	48.26		
	15-20	96	38	<1	0.12	1.16	91.4	46.57		
	20-25	90	38	<1	0.12	1.24	90.6	46.82		
	0-2	1460	240	8	1.27	3.20	94.6	45.58		
	2-4	1100	270	9	0.68	3.50	93.3	47.02		
2	4-6	690	200	5	0.47	2.74	93.2	47.37		
	6-8	370	110	2	0.25	2.02	92.8	47.23		

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=MANITOBA				LAKE=CLEAVER LAKE				
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION
2	8-10	190	60	<1	0.16	1.50	92.4	47.77
	10-15	120	45	<1	0.13	1.28	92.1	48.43
	15-20	90	36	<1	0.11	1.17	91.5	46.61
	20-25	86	36	<1	0.09	1.06	90.5	47.27
3	0-2	1640	200	8	1.26	2.65	95.3	44.16
	2-4	1330	240	8	0.84	2.77	94.0	46.31
	4-6	980	260	9	0.57	2.73	93.6	44.43
	6-8	880	230	7	0.33	2.61	93.0	46.11
	8-10	810	180	5	0.34	2.56	92.7	45.88
	10-15	98	36	<1	0.10	1.02	92.1	46.73
	15-20	92	34	<1	0.08	0.81	91.4	47.17
	20-25	160	55	1	0.16	1.11	90.6	47.98
	0-2	910	190	5	0.70	2.01	95.0	48.64
	2-4	790	220	6	0.67	2.90	94.2	47.72
	4-6	460	140	4	0.29	2.26	93.8	47.97
	6-8	140	48	<1	0.18	1.50	93.2	48.63
4	8-10	130	46	<1	0.15	1.24	92.4	46.87
	10-15	110	45	<1	0.11	0.97	91.8	47.21
	15-20	89	42	<1	0.10	1.12	91.0	46.43
	20-25	86	40	<1	0.08	1.24	90.6	48.90

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=MANITOBA				LAKE=NAOSAP MUD LAKE				
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION
1	0-2					1.67	97.9	
	2-4	110	36	<1	0.25	1.63	97.3	60.88
	4-6	77	31	<1	0.08	1.42	97.0	60.98
	6-8	330	69	2	0.09	1.20	97.1	61.64
	8-10	270	64	2	0.07	0.95	96.9	61.46
	10-15	130	35	<1	0.07	0.95	96.7	61.98
	15-20	75	24	<1	0.06	0.70	96.7	60.84
	20-25	45	14	<1	0.06	0.74	96.6	60.38
	0-2	65	25	<1	<0.01	1.34	97.4	61.11
	2-4	82	23	<1	<0.01	1.50	97.2	61.10
2	4-6	1550	77	3	<0.01	1.35	97.0	60.78
	6-8	1120	120	4	<0.01	0.94	96.7	61.64
	8-10	380	54	1	<0.01	0.90	96.5	61.64
	10-15	140	35	<1	0.05	0.74	96.4	60.41
	15-20	70	24	<1	0.04	0.73	96.2	60.80
	20-25	86	21	<1	0.05	0.83		59.97
	0-2	420	69	3	0.08	1.49		60.80
	2-4	320	58	3	0.07	1.38	94.6	60.70
	4-6	150	37	1	0.05	1.06	95.7	62.52
	6-8	70	26	<1	0.06	0.88	95.7	62.98
3	8-10	60	24	<1	0.05	0.90	95.4	62.85
	10-15	56	23	<1	0.06	0.87	95.1	62.11
	15-20	61	22	<1	0.04	0.80	94.9	62.04
	20-25	59	19	<1	0.06	0.75	93.9	61.20
	0-2	360	54	2	0.22	1.21	97.0	66.52
	2-4	290	63	3	0.14	1.40	96.1	

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=MANITOBA				LAKE=NAOSAP MUD LAKE				
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION
4	4-6	220	61	2	0.21	1.38	95.0	61.32
	6-8	120	28	<1	0.13	0.72	95.9	
	8-10	72	19	<1	0.09	0.93	95.6	63.18
	10-15	54	19	<1	0.08	0.83	95.2	61.49
	15-20	52	18	<1	0.08	0.85	94.4	60.61
	20-25	53	20	<1	0.05	0.83	93.9	58.54

REGION=MANITOBA					DISTANCE (km) FROM SMELTER=30			LAKE=KOTYK LAKE	
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION	
1	0-2	610	95	4	0.38	2.61	95.0	64.06	
	2-4	630	100	4	0.23	2.50	94.6	64.02	
	4-6	620	100	4	0.65	2.50	95.2	64.60	
	6-8	540	100	4	0.46	2.72	95.7	63.91	
	8-10	410	98	4		2.60	95.4		
	10-15	240	69	2	0.16	2.00	95.0	63.01	
2	15-20	420	100	4	0.27	2.25	94.8	63.31	
	20-25	99	34	<1	0.10	1.49	93.3	63.43	
	0-2	650	100	4	0.33	2.27	95.9	64.45	
	2-4	500	95	3	0.01	2.32	94.6	64.41	
	4-6	460	100	3	0.26	2.44	95.2	64.10	
	6-8	360	100	2	0.31	2.52	95.6	64.72	
	8-10	290	88	2	0.25	2.48	95.5	65.27	
	10-15	200	62	1	0.18	2.24	95.9	64.26	
	15-20	140	40	<1	0.14	1.85			
	20-25	79	27	<1		1.64	96.1		

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=MANITOBA				DISTANCE (km) FROM SHELTER=30			LAKE=KOTYK LAKE	
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION
3	0-2	260	34	<1		2.31	97.7	
	2-4	260	38	<1		2.56	97.3	
	4-6	410	57	2		2.54	97.6	
	6-8	560	83	3		2.56	90.1	
	8-10	810	130	6		2.75	96.9	
	10-15	360	55	2	0.32	2.33	96.8	
	15-20	310	56	2	0.14	1.77	96.7	
	20-25	380	91	3	0.11	1.43	96.6	
	0-2				0.33	2.51	97.2	
	2-4	200	66	2		2.61	97.1	
	4-6	97	36	<1		2.91	97.0	
	6-8	550	110	4		3.31	96.9	
	8-10	380	99	3		2.95	96.9	
	10-15	260	75	3	0.19	2.52	96.9	
	15-20	200	56	2	0.11	2.15	96.8	64.67
	20-25	150	51	<1	0.08	1.78	96.6	

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

CORE		SECTION (cm)	REGION-MANITOBA		DISTANCE (km) FROM SMELTER=43	LAKE-NEKIK LAKE		SELENIUM		% H ₂ O	% WEIGHT LOSS ON IGNITION	
			ZINC	COPPER	CADMIUM	MERCURY						
1		0-2	180	31	<1	0.14	0.77	95.7	39.08			
		2-4	180	24	<1	0.12	0.61	92.7	30.28			
		4-6	130	26	<1	0.09	0.89	91.9	30.84			
		6-8	120	17	<1	0.09	0.82	89.1	23.43			
		8-10	75	10	<1	0.04	0.20	91.6	14.26			
		10-15	63	8	<1	0.03	<0.10	79.9	12.30			
		15-20	42	12	<1	<0.01	<0.10	42.9	2.45			
		20-25	32	6	<1	0.01	0.38	41.5	2.38			
		0-2	130	37	<1	0.13	0.97	96.6	50.16			
		2-4	210	31	<1	0.12	1.06	96.0	50.51			
2		4-6	230	36	1	0.06	1.54	95.7	47.56			
		6-8	220	36	1	0.05	1.40	95.1	44.73			
		8-10	170	30	1	0.05	1.31	94.7	46.01			
		10-15	190	34	<1	0.07	1.23	94.3	44.92			
		15-20	160	30	1	0.04	1.37	96.0	53.27			
		20-25	140	28	<1	0.02	1.46	95.2	55.62			
		0-2	180	31	2	0.04	0.97	96.0	34.31			
		2-4	190	31	2	0.03	0.91	94.8	40.57			
		4-6	180	33	2	0.02	0.95	94.5	42.05			
		6-8	180	38	2	0.15	1.18	94.0	41.12			
3		8-10	160	37	2	0.11	1.25	93.3	39.43			
		10-15	130	31	1	0.08	1.07	92.7	36.70			
		15-20	79	18	<1	0.03	0.65	88.4	25.37			
		20-25	65	20	1	0.03	0.70	88.3	29.70			
		0-2	190	39	<1	0.05	1.32	97.0				
		2-4	220	40	1	0.05	1.34	96.4	53.61			
4		0-2	180	31	2	0.04	0.97	96.0	34.31			
		2-4	190	31	2	0.03	0.91	94.8	40.57			
		4-6	180	33	2	0.02	0.95	94.5	42.05			
		6-8	180	38	2	0.15	1.18	94.0	41.12			
		8-10	160	37	2	0.11	1.25	93.3	39.43			
		10-15	130	31	1	0.08	1.07	92.7	36.70			
		15-20	79	18	<1	0.03	0.65	88.4	25.37			
		20-25	65	20	1	0.03	0.70	88.3	29.70			
		0-2	190	39	<1	0.05	1.32	97.0				
		2-4	220	40	1	0.05	1.34	96.4	53.61			

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION=MANITOBA							LAKE=NEKIK LAKE						
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION					
4	4-6	230	39	1	0.06	1.36	96.1	53.37					
	6-8	260	44	1	0.22	1.48	95.4	53.11					
	8-10	240	44	1	0.22	1.42	95.0	52.14					
	10-15	210	40	1	0.17	1.41	95.1	48.65					
	15-20	130	32	1	0.10	1.28	94.0	46.36					
	20-25	110	29	<1	0.07	1.56	94.4	49.57					

REGION=SASKATCHEWAN							LAKE=SASK LAKE NO.1						
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION					
1	0-2	120	44	1	0.12	0.90	94.3	30.76					
	2-4	130	44	<1	0.12	0.88	92.7	29.83					
	4-6	130	48	<1	0.12	0.82	80.9	26.83					
	6-8	130	48	<1	0.11	1.00	80.1	26.10					
	8-10	130	45	<1	0.10	0.92		24.92					
	10-15	130	48	<1	0.11	0.97	87.0	27.35					
	15-20	110	42	<1	0.05	0.86	85.5	22.41					
	20-25	130	45	<1	0.12	0.92	83.8	26.74					
	0-2	110	43	<1	0.07	0.79	91.5	24.16					
	2-4	120	45	<1	0.09	0.92	90.4	25.74					
2	4-6	120	45	<1	0.10	0.96	94.2	25.74					
	6-8	120	43	<1	0.18	0.90	91.9	29.78					
	8-10	120	43	<1	0.12	0.93	90.7	28.72					
	10-15	130	47	<1	0.12	0.94		27.18					
	15-20	110	41	<1	0.08	0.84	89.8	28.80					
	20-25	110	40	<1	0.06	0.79	88.1	23.96					

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION-SASKATCHEWAN

SECTION (cm)

CORE

ZINC

COPPER

CADMIUM

MERCURY

SELENIUM

% H₂O

% WEIGHT LOSS
ON IGNITION

LAKE-SASK LAKE NO. 1

SMELTER-68

DISTANCE (km)

FROM

SECTION (cm)

3

120

46

<1

0.13

0.93

94.3

29.83

110

45

<1

0.05

0.77

91.6

22.90

130

50

<1

0.13

0.80

89.7

26.89

130

49

<1

0.11

0.74

89.0

27.80

120

47

<1

0.11

0.88

86.6

27.34

100

42

<1

0.10

0.77

85.1

27.18

110

46

<1

0.06

0.72

85.1

25.65

120

45

<1

0.06

0.83

81.5

25.01

120

46

<1

0.13

0.92

94.7

30.82

130

48

<1

0.13

0.90

93.0

30.83

120

47

<1

0.11

0.90

92.5

30.24

110

44

<1

0.09

0.87

92.0

28.89

100

44

<1

0.07

0.79

89.2

27.30

100

45

<1

0.06

0.79

87.6

26.80

130

47

<1

0.12

0.97

86.6

30.18

4

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

----- REGION=SASKATCHEWAN										DISTANCE (km) FROM SHELTER=74										LAKE=SASK LAKE NO.2										-----									
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION																															
1	0-2	170	41	<1	0.12	1.21	86.9	24.76																															
	2-4	170	39	<1	0.15	1.43	85.4	25.53																															
	4-6	180	39	<1	0.14	1.53	85.4	25.28																															
	6-8	180	41	<1	0.12	1.27	85.5	24.91																															
	8-10	160	40	<1	0.09	1.04	85.4	24.90																															
	10-15	170	40	<1	0.08	1.01	85.6	26.00																															
	15-20	170	41	<1	0.07	1.09	84.4	27.60																															
	20-25	190	39	<1	0.07	1.27	82.7	27.02																															
	0-2	190	41	<1	0.14	1.36	89.7	26.54																															
	2-4	170	41	<1	0.14	1.42	86.4	27.08																															
2	4-6	170	40	<1	0.11	1.15	84.2	25.42																															
	6-8	180	42	<1	0.15	1.24	87.7	26.41																															
	8-10	150	38	<1	0.09	0.92		25.58																															
	10-15	160	38	<1	0.08	0.95	79.7	25.78																															
	15-20	160	40	<1	0.07	1.07	87.6	26.32																															
	20-25	170	40	<1	0.06	1.17	84.1	27.33																															
	0-2	180	40	<1	0.15	1.37		26.46																															
	2-4	180	41	<1	0.18	1.48	78.8	27.23																															
	4-6	190	36	<1	0.14	1.28	86.3	25.86																															
	6-8	160	38	<1	0.10	1.05	85.9	25.32																															
3	8-10	160	40	<1	0.09	0.94	85.8	25.54																															
	10-15	160	42	<1	0.07	0.93	85.6	25.76																															
	15-20	160	41	<1	0.07	1.15	84.6	26.57																															
	20-25	190	42	<1	0.06	1.31	83.6	27.28																															
	0-2	160	43	<1	0.17	1.37	90.4	28.03																															
	2-4	160	45	<1	0.17	1.41	88.5	27.91																															

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

REGION-SASKATCHEWAN							LAKE-SASK LAKE NO.2						
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION					
4	4-6	170	44	<1	0.15	1.24	87.2	26.96					
	6-8	150	40	<1	0.12	0.99	86.7	25.99					
	8-10	140	40	<1	0.10	0.93	86.3	26.16					
	10-15	150	40	<1	0.08	0.66	86.1	26.73					
	15-20	140	39	<1	0.07	1.04	85.6	27.59					
	20-25	150	41	<1	0.06	1.17	84.9	28.01					

REGION-SASKATCHEWAN							LAKE-SASK LAKE NO.4						
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION					
1	0-2	140	58	<1	0.21	0.82	91.9	24.83					
	2-4	150	57	<1	0.22	0.74	89.3	24.21					
	4-6	150	57	<1	0.19	0.84	88.2	23.91					
	6-8	140	58	<1	0.22	0.87	87.0	23.91					
	8-10	130	53	<1	0.20	0.81	86.1	23.51					
	10-15	130	55	<1	0.18	0.73	79.5	23.33					
	15-20	130	54	<1	0.14	0.75	81.3	22.71					
	20-25	130	56	<1	0.14	0.69	82.2	22.35					
	0-2	140	56	<1	0.23	0.81	90.9	24.29					
	2-4	150	59	<1	0.22	0.85	91.2	24.20					
2	4-6	140	56	<1	0.22	0.85	94.3	24.12					
	6-8	150	59	<1	0.23	0.85	91.3	23.94					
	8-10	130	55	<1	0.19	0.80	86.7	23.50					
	10-15	130	53	<1	0.17	0.74	85.2	23.15					
	15-20	120	52	<1	0.15	0.66	79.6	22.46					
	20-25	130	56	<1	0.12	0.81	81.7	21.48					

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

----- REGION=SASKATCHEWAN DISTANCE (km) FROM SHELTER=83 LAKE=SASK LAKE NO.4 -----									
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION	
3	0-2	150	57	<1	0.24	0.89	82.0	24.28	
	2-4	140	58	<1	0.25	0.95	89.4	23.94	
	4-6	140	59	<1	0.22	0.93	88.5	23.80	
	6-8	140	57	<1	0.20	0.90	87.6	23.83	
	8-10	140	57	<1	0.20	0.81	86.6	23.63	
	10-15	130	54	<1	0.17	0.87	85.6	23.22	
	15-20	130	55	<1	0.12	0.80	84.0	21.82	
	20-25	120	55	<1	0.16	0.78	82.8	22.74	
	0-2	140	57	<1	0.21	0.92	88.7	23.39	
	2-4	140	54	<1	0.21	0.93	92.2	24.68	
4	4-6	140	56	<1	0.22	0.87	89.7	23.84	
	6-8	140	56	<1	0.20	0.89	87.4	23.81	
	8-10	140	57	<1	0.20	0.83	86.1	24.24	
	10-15	130	54	<1	0.17	0.82	84.4	23.49	
	15-20	130	56	<1	0.11	0.73	83.0	18.73	
	20-25	120	55	<1	0.13	0.67	81.6	22.28	

METAL CONCENTRATIONS IN SEDIMENT CORES IN MICROGRAMS PER GRAM DRY WEIGHT									
REGION=SASKATCHEWAN DISTANCE (km) FROM SMELTER=84 LAKE=SASK LAKE NO.3									
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H ₂ O	% WEIGHT LOSS ON IGNITION	
1	0-2	25	8	<1	0.02	0.12	47.6	2.64	
	2-4	29	9	<1	0.02	<0.10	32.1	1.63	
	4-6	34	12	<1	0.02	0.13	37.2	2.42	
	6-8	66	22	<1	0.03	0.28	48.2	3.86	
	8-10	65	24	<1	0.03	0.32	53.1	4.69	
	10-15	70	27	<1	0.02	0.35	53.3	5.15	
	15-20	75	28	<1	0.02	0.38	55.2	4.89	
	20-25	89	34	<1	0.02	0.21	54.6	3.98	
	0-2	31	10	<1	0.02	0.14	49.0	2.64	
	2-4	35	11	<1	0.02	0.19	39.0	2.54	
2	4-6	65	22	<1	0.02	0.36	43.1	4.76	
	6-8	66	24	<1	0.02	0.27	60.2	4.83	
	8-10	75	30	<1	0.02	0.19	53.3	4.53	
	10-15	110	37	<1	0.03	0.12	56.2	3.25	
	15-20	120	44	<1	0.02	<0.10	56.5	3.07	
	20-25	110	44	<1	0.02	<0.10	56.5	3.01	
	0-2	66	17	<1	0.05	0.3	74.8	6.48	
	2-4	47	14	<1	0.04	0.16	62.1	4.91	
	4-6	42	12	<1	0.02	0.13	52.1	3.25	
	8-8	35	12	<1	0.02	<0.10	42.7	2.34	
3	8-10	47	15	<1	0.01	0.16	50.5	4.03	
	10-15	52	15	<1	<0.01	0.18	53.9	4.62	
	15-20	76	23	<1	0.01	0.27	57.6	6.98	
	20-25	60	18	<1	0.01	0.26	56.4	5.78	
	0-2	63	18	<1	0.04	0.36	76.1	7.35	
	2-4	43	12	<1	0.02	0.18	57.1	4.28	
4	0-2	25	8	<1	0.02	0.12	47.6	2.64	
	2-4	29	9	<1	0.02	<0.10	32.1	1.63	
	4-6	34	12	<1	0.02	0.13	37.2	2.42	
	6-8	66	22	<1	0.03	0.28	48.2	3.86	
	8-10	65	24	<1	0.03	0.32	53.1	4.69	
	10-15	70	27	<1	0.02	0.35	53.3	5.15	
	15-20	75	28	<1	0.02	0.38	55.2	4.89	
	20-25	89	34	<1	0.02	0.21	54.6	3.98	
	0-2	31	10	<1	0.02	0.14	49.0	2.64	
	2-4	35	11	<1	0.02	0.19	39.0	2.54	

METAL CONCENTRATIONS IN SEDIMENT CORES
IN MICROGRAMS PER GRAM DRY WEIGHT

----- REGION=SASKATCHEWAN DISTANCE (km) FROM SMELTER=84 LAKE=SASK LAKE NO.3 -----									
CORE	SECTION (cm)	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	% H2O	% WEIGHT LOSS ON IGNITION	
4	4-6	26	9	<1	0.01	<0.10	40.0	2.16	
	6-8	34	12	<1	<0.01	<0.10	43.5	2.82	
	8-10	28	7	<1	<0.01	<0.10	33.2	1.55	
	10-15	36	12	<1	<0.01	0.12	41.5	2.96	
	15-20	40	10	<1	<0.01	0.10	39.2	2.95	
	20-25	75	24	<1	0.02	0.33	55.8	6.27	

Appendix 2.

Means and standard deviations of metal concentrations in sediment core samples.

MEANS AND STANDARD DEVIATIONS OF METAL CONCENTRATIONS IN SEDIMENT CORES
MICROGRAMS PER GRAM DRY WEIGHT

REGION=FLIN FLOW				DISTANCE (km) FROM SMELTER=4				LAKE=HAMELL LAKE			
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	
0-2	8408	1290	2775	90	56	4	3.27	3.14	11.1	2.3	
2-4	10388	1130	2938	104	61	4	7.14	2.88	13.3	0.3	
4-6	9610	847	2910	55	61	2	5.03	1.43	13.9	0.8	
6-8	8450	1065	2785	225	56	4	3.85	1.94	13.5	1.0	
8-10	7408	1090	2450	520	50	6	3.10	0.84	12.5	0.9	
10-15	6638	1094	1918	678	42	11	3.62	1.25	10.2	2.4	
15-20	4530	1021	843	347	24	8	1.56	0.84	5.5	1.7	
20-25	1658	548	228	85	6	3	0.31	0.12	2.3	0.5	

REGION=FLIN FLOW				DISTANCE (km) FROM SMELTER=5				LAKE=DOUGLAS LAKE			
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	
0-2	12625	1255	1900	57	60	3	3.77		12.6	2.0	
2-4	13025	1424	1915	85	62	3	7.27	1.36	13.3	2.5	
4-6	12700	1146	1878	56	61	2	4.75	2.04	13.0	2.4	
6-8	9845	5938	1465	891	46	28	3.12	1.93	11.7	6.3	
8-10	13050	719	1958	40	61	3	4.61	0.86	14.5	0.3	
10-15	13575	479	1915	129	61	3	5.62	0.46	15.8	0.7	
15-20	8355	2861	1235	406	38	13	2.67	1.00	11.4	3.1	
20-25	5840	5522	874	825	28	27	2.08	2.31	7.8	5.5	

FOR CALCULATION OF MEANS, DATA REPORTED AS LESS THAN DETECTION LIMIT WERE SET TO 0.5 OF DETECTION LIMIT

MEANS AND STANDARD DEVIATIONS OF METAL CONCENTRATIONS IN SEDIMENT CORES
MICROGRAMS PER GRAM DRY WEIGHT

SECTION (cm)	REGION=FLIN FLOW				DISTANCE (km) FROM SHELTER=5				LAKE=PHANTOM LAKE			
	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	SELENIUM (MEAN)	(SD)
0-2	6988	1687	1385	613	37	11	9.22	2.06	4.5	3.2		
2-4	4660	4206	1050	1001	26	24	4.46	4.66	4.2	3.5		
4-6	3218	4050	662	839	16	21	2.37	3.29	2.9	3.8		
6-8	3020	3429	655	750	16	18	4.02	5.29	3.5	3.8		
8-10	2448	2755	565	636	13	15	1.87	2.09	2.3	2.7		
10-15	553	731	138	159	3	4	0.29	0.40	0.6	0.9		
15-20	90	37	29	11	<1		0.05	0.04	0.2	0.2		
20-25	73	28	23	10	<1		0.03	0.02	0.2	0.1		

SECTION (cm)	REGION=FLIN FLOW				DISTANCE (km) FROM SHELTER=6				LAKE=CLIFF LAKE			
	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	SELENIUM (MEAN)	(SD)
0-2	5950	373	1278	60	21	1	6.39	1.31	4.0	0.2		
2-4	6190	292	1288	24	24	1	3.97	1.13	4.0	0.4		
4-6	4963	570	1160	67	22	1	2.46	0.63	3.5	0.3		
6-8	2425	1788	620	446	12	10	1.03	0.53	2.6	0.9		
8-10	595	592	163	151	3	4	0.31	0.21	1.1	0.6		
10-15	155	47	45	19	<1		0.10	0.03	0.5	0.2		
15-20	149	54	45	16	<1		0.08	0.01	0.5	0.1		
20-25	105	29	34	10	<1		0.06	0.03	0.4	0.2		

FOR CALCULATION OF MEANS, DATA REPORTED AS LESS THAN DETECTION LIMIT WERE SET TO 0.5 OF DETECTION LIMIT

MEANS AND STANDARD DEVIATIONS OF METAL CONCENTRATIONS IN SEDIMENT CORES
MICROGRAMS PER GRAM DRY WEIGHT

REGION=FLIN FLON DISTANCE (km) FROM SMELTER=8 LAKE=MERIDIAN LAKE										
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)
0-2	2858	317	568	22	15	0	2.69	0.16	3.4	0.4
2-4	3080	401	583	6	16	1	2.67	0.24	4.1	0.9
4-6	2555	268	535	19	14	1	2.06	0.46	3.5	0.2
6-8	2193	436	520	24	13	1	1.62	0.54	3.3	0.2
8-10	1685	230	450	47	11	1	1.12	0.32	2.9	0.2
10-15	488	131	140	47	4	1	0.31	0.11	1.5	0.3
15-20	103	21	28	5	<1		0.09	0.01	0.5	0.1
20-25	102	16	35	8	<1		0.07	0.01	0.7	0.4
25-30	87	1	33	0	<1		0.06	0.01	0.3	0.0
30-35	98	2	41	0	<1		0.04	0.01	<0.1	

REGION=MANITOBA				DISTANCE (km)		FROM SMELTER=23		LAKE=CLEAVER LAKE		
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)
0-2	1238	368	198	33	7	2	1.31	0.53	2.5	0.5
2-4	1035	234	235	26	7	2	0.70	0.10	3.0	0.3
4-6	635	260	180	63	5	3	0.42	0.13	2.5	0.3
6-8	410	327	116	80	3	3	0.25	0.06	1.9	0.5
8-10	268	230	84	64	2	2	0.20	0.09	1.7	0.6
10-15	115	14	42	4	<1		0.12	0.02	1.1	0.1
15-20	92	3	38	3	<1		0.10	0.02	1.1	0.2
20-25	106	36	42	9	<1		0.11	0.04	1.2	0.1

MEANS AND STANDARD DEVIATIONS OF METAL CONCENTRATIONS IN SEDIMENT CORES
MICROGRAMS PER GRAM DRY WEIGHT

REGION=MANITOBA				DISTANCE (km) FROM SMELTER=27				LAKE=NAUSAP MUD LAKE			
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	
0-2	282	190	49	22	2	1	0.10	0.11	1.4	0.2	
2-4	201	122	45	19	2	1	0.12	0.10	1.5	0.1	
4-6	499	703	52	21	2	1	0.09	0.09	1.3	0.2	
6-8	410	487	61	44	2	2	0.07	0.05	0.9	0.2	
8-10	196	156	40	22	1	1	0.05	0.04	0.9	0.0	
10-15	95	46	29	9	<1		0.07	0.01	0.8	0.1	
15-20	65	10	22	3	<1		0.06	0.02	0.8	0.1	
20-25	61	18	19	3	<1		0.06	0.01	0.8	0.0	

REGION=MANITOBA				DISTANCE (km) FROM SMELTER=30				LAKE=KOTVK LAKE			
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	
0-2	507	215	76	37	3	2	0.35	0.03	2.4	0.2	
2-4	398	202	75	29	2	1	0.12	0.16	2.5	0.1	
4-6	397	219	73	32	2	1	0.46	0.28	2.6	0.2	
6-8	503	95	98	11	3	1	0.39	0.11	2.8	0.4	
8-10	473	231	104	18	4	2	0.25		2.7	0.2	
10-15	265	68	65	9	2	1	0.21	0.07	2.3	0.2	
15-20	266	124	64	26	2	1	0.17	0.07	2.0	0.2	
20-25	177	139	51	29	1	1	0.10	0.02	1.6	0.2	

FOR CALCULATION OF MEANS, DATA REPORTED AS LESS THAN DETECTION LIMIT WERE SET TO 0.5 OF DETECTION LIMIT

MEANS AND STANDARD DEVIATIONS OF METAL CONCENTRATIONS IN SEDIMENT CORES
MICROGRAMS PER GRAM DRY WEIGHT

REGION=MANITOBA				DISTANCE (km) FROM SMELTER=43				LAKE=NEKIK LAKE			
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	
0-2	170	27	35	4	<1		0.09	0.05	1.0	0.2	
2-4	193	31	32	7	1	1	0.08	0.05	1.0	0.3	
4-6	193	48	34	6	1	1	0.06	0.03	1.2	0.3	
6-8	195	60	34	12	1	1	0.13	0.07	1.1	0.4	
8-10	161	68	30	15	1	1	0.11	0.08	1.0	0.6	
10-15	148	66	28	14	<1		0.09	0.06	0.9	0.6	
15-20	103	53	23	10	<1		0.04	0.04	1.0	0.4	
20-25	87	48	21	11	<1		0.03	0.03	1.0	0.6	

REGION=SASKATCHEWAN				DISTANCE (km) FROM SMELTER=68				LAKE=SASK LAKE NO.1			
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	
0-2	118	5	45	1	<1		0.11	0.03	0.9	0.1	
2-4	120	8	45	1	<1		0.10	0.04	0.9	0.1	
4-6	128	5	48	2	<1		0.12	0.01	0.9	0.1	
6-8	125	6	47	3	<1		0.13	0.04	0.9	0.1	
8-10	120	8	45	2	<1		0.11	0.01	0.9	0.0	
10-15	120	14	47	2	<1		0.10	0.02	0.9	0.1	
15-20	105	6	43	2	<1		0.06	0.01	0.8	0.1	
20-25	120	12	45	3	<1		0.09	0.03	0.9	0.1	

MEANS AND STANDARD DEVIATIONS OF METAL CONCENTRATIONS IN SEDIMENT CORES
MICROGRAMS PER GRAM DRY WEIGHT

REGION=SASKATCHEWAN				DISTANCE (km) FROM SMELTER=74				LAKE=SASK LAKE NO.2			
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	
0-2	175	13	41	1	<1		0.15	0.02	1.3	0.1	
2-4	170	8	42	3	<1		0.16	0.02	1.4	0.0	
4-6	178	10	40	3	<1		0.14	0.02	1.3	0.2	
6-8	168	15	40	2	<1		0.12	0.02	1.1	0.1	
8-10	153	10	40	1	<1		0.09	0.00	1.0	0.1	
10-15	160	8	40	1	<1		0.08	0.00	1.0	0.0	
15-20	158	13	40	1	<1		0.07	0.00	1.1	0.0	
20-25	175	19	41	1	<1		0.06	0.00	1.2	0.1	

REGION=SASKATCHEWAN				DISTANCE (km) FROM SMELTER=83				LAKE=SASK LAKE NO.4			
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)	
0-2	143	5	57	1	<1		0.22	0.02	0.9	0.1	
2-4	145	6	57	2	<1		0.23	0.02	0.9	0.1	
4-6	143	5	57	1	<1		0.21	0.01	0.9	0.0	
6-8	143	5	58	1	<1		0.21	0.02	0.9	0.0	
8-10	135	6	56	2	<1		0.20	0.01	0.8	0.0	
10-15	130	0	54	1	<1		0.17	0.01	0.8	0.1	
15-20	128	5	54	2	<1		0.13	0.02	0.7	0.1	
20-25	125	6	56	1	<1		0.14	0.02	0.7	0.1	

MEANS AND STANDARD DEVIATIONS OF METAL CONCENTRATIONS IN SEDIMENT CORES
MICROGRAMS PER GRAM DRY WEIGHT

REGION=SASKATCHEWAN			DISTANCE (km) FROM SMELTER=84			LAKE=SASK LAKE NO.3				
SECTION (cm)	ZINC (MEAN)	(SD)	COPPER (MEAN)	(SD)	CADMIUM (MEAN)	(SD)	MERCURY (MEAN)	(SD)	SELENIUM (MEAN)	(SD)
0-2	46	21	13	5	<1		0.03	0.02	0.2	0.1
2-4	39	8	12	2	<1		0.03	0.01	0.1	0.1
4-6	35	27	14	6	<1		0.02	0.01	0.2	0.1
6-8	50	18	18	6	<1		0.02	0.01	0.2	0.1
8-10	54	21	19	10	<1		0.02	0.01	0.2	0.1
10-15	67	32	23	12	<1		0.02	0.01	0.2	0.1
15-20	78	33	26	14	<1		0.01	0.01	0.2	0.2
20-25	84	21	30	11	<1		0.02	0.01	0.2	0.1

FOR CALCULATION OF MEANS, DATA REPORTED AS LESS THAN DETECTION LIMIT WERE SET TO 0.5 OF DETECTION LIMIT

Appendix 3.

General characteristics and metal concentrations in liver and muscle of white sucker and northern pike from the study lakes.

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	REGION=FLIN FLOM DISTANCE (km) FROM SMELTER=4 LAKE=HAMELL LAKE						
							ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	1	FEMALE	558	1210	0.70	L	30	9.2	0.68	0.03	2.18		0.06
						M	4.2	0.20	<0.01	0.07	1.33	0.04	0.03
	2	FEMALE	512	905	0.67	L	112	30.2	1.00	0.03	3.25		0.06
						M	4.0	0.17	<0.01	0.04	0.84	<0.02	0.01
	3	FEMALE	606	1430	0.64	L	111	31.5	1.3	0.04	3.39		0.06
						M	4.0	0.12	<0.01	0.07	1.02	<0.02	0.03
	4	FEMALE	466	725	0.72	L	117.0	15.7	0.57	<0.01	2.03		0.06
WHITE SUCKER						M	4.8	0.16	<0.01	0.02	1.05	<0.02	0.03
	5	FEMALE	500	905	0.72	L	91	22.3	0.26	<0.01	2.40		0.10
						M	5.4	0.18	<0.01	0.03	1.17	<0.02	0.03
	6	FEMALE	559	1140	0.65	L	146	13.5	0.88	0.04	3.20		0.05
						M	4.1	0.17	<0.01	0.07	1.14	<0.02	<0.01
	7	FEMALE	675	2095	0.68	L	96	14.1	0.84	0.04	1.66		0.05
						M	4.8	0.19	<0.01	0.07	0.96	<0.02	<0.01
	1	FEMALE	470	1422	1.37	L	64	19.0	1.0	<0.01	2.18		0.33
						M	4.0	0.17	<0.01	0.02	0.96	<0.01	<0.01
	2	FEMALE	436	1113	1.32	L	45	8.6	0.30	0.01	1.95		0.78
						M	11	0.14	<0.01	0.02	1.35	<0.01	<0.01
	3	FEMALE	473	1690	1.60	L	31	15.4	0.39	0.01	2.35		0.03
						M	6.5	0.26	<0.01	0.01	1.63	<0.01	<0.01
	4	FEMALE	439	1270	1.50	L	34	11.6	0.31	0.01	2.28		0.06
						M	8.7	0.25	<0.01	0.03	1.14	<0.01	<0.01
	5	FEMALE	430	1160	1.46	L	33	6.6	<0.04	<0.01	1.60		0.03
						M	7.3	0.27	<0.01	0.03	1.60	<0.01	<0.01
	6	MALE	436	1302	1.57	L	20	4.8	0.04	<0.01	1.47		0.03
						M	11	0.38	<0.01	0.03	1.21	<0.01	<0.01

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=PLIN FLOW					DISTANCE (km) FROM SMELTER=4				LAKE=HAMELL LAKE				
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	7	FEMALE	500	1655	1.32	L	42	16.6	0.75	0.01	1.95		0.07
						M	7.3	0.29	<0.01	0.06	1.27	<0.01	<0.01
	8	MALE	443	1399	1.61	L	26	8.9	0.43	0.01	2.27		0.20
						M	5.9	0.36	<0.01	0.03	1.24	<0.01	<0.01
	9	FEMALE	515	1851	1.36	L	36	22.5	0.58	0.01	1.87		0.10
						M	4.2	0.22	<0.01	0.02	0.97	<0.01	<0.01
	10	FEMALE	475	1615	1.51	L	51	26.3	0.75	0.01	2.86		0.08
						M	15	0.22	<0.01	0.04	1.09	<0.01	<0.01
	11	MALE	435	1075	1.31	L	44	11.6	0.49	0.02	2.29		0.14
						M	8.6	0.32	<0.01	0.06	1.46	<0.01	<0.01
	12	FEMALE	501	1889	1.50	L	35	10.1	0.89	<0.01	1.66		0.03
						M	4.9	0.24	<0.01	0.04	1.08	<0.01	<0.01
	13	MALE	432	1230	1.53	L	48	13.4	0.37	0.02	2.38		0.29
						M	8.0	0.27	<0.01	0.02	1.66	<0.01	<0.01
	14	MALE	430	1330	1.67	L	46	12.6	0.98	0.02	2.42		0.06
						M	5.8	0.35	<0.01	0.09	1.28	<0.01	<0.01
15	FEMALE	472	1640	1.56	L	34	10.0	0.39	0.01	1.97		0.04	
					M	5.2	0.23	<0.01	0.04	1.00	<0.01	<0.01	
16	MALE	444	1200	1.37	L	48	14.6	0.40	<0.01	2.55		0.18	
					M	4.7	0.26	<0.01	0.02	1.24	<0.01	<0.01	

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

SPECIES	FISH NO.	SEX	REGION=FLIN FLOW				DISTANCE (km)	CONDITION FACTOR	TISSUE	LAKE=DOUGLAS LAKE					
			LENGTH (CM)	WEIGHT (GM)	FLIN	FROM SMELTER-B				COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	1	FEMALE	554	1095			0.64	L	51	26.1	0.20	0.07	3.49	<0.2	<0.05
	2	MALE	489	850			0.64	M	5.0	0.12	<0.01	0.08	0.59	<0.05	<0.05
	3	FEMALE	523	897			0.56	L	38	33.0	0.42	0.16	3.14	<0.2	<0.05
	4	FEMALE	554	980			0.56	M	3.6	0.11	<0.01	0.18	0.49	<0.05	<0.05
	5	MALE	454	690			0.82	L	51	34.2	0.33	0.10	3.46	<0.2	<0.05
	6	FEMALE	513	850			0.82	M	4.1	0.11	<0.01	0.08	0.55	<0.05	<0.05
	7	FEMALE	576	1193			0.58	L	71	36.0	0.33	0.15	3.76	<0.2	<0.05
	8	MALE	444	605			0.58	M	4.1	0.11	<0.01	0.11	0.53	<0.05	<0.05
	9	UNKNOWN	465	595			0.74	L	40	13.9	0.12	0.04	2.78	<0.2	<0.05
	10	UNKNOWN	485	555			0.74	M	4.8	0.13	<0.01	0.06	0.66	<0.05	<0.05
	11	FEMALE	495	690			0.63	L	34	24.4	0.16	0.08	3.03	<0.2	<0.05
	12	FEMALE	587	1038			0.63	M	5.1	0.16	<0.01	0.09	0.63	<0.05	<0.05
	13	FEMALE	463	663			0.62	L	41	26.4	0.11	0.07	3.50	<0.2	<0.05
							0.62	M	4.3	0.10	<0.01	0.09	0.76	<0.05	<0.05
							0.69	L	43	25.6	0.13	0.07	3.21	<0.2	<0.05
							0.69	M	4.4	0.09	<0.01	0.08	0.64	<0.05	<0.05
							0.59	L	32	20.3	0.11	0.04	2.81	<0.2	<0.05
							0.59	M	3.6	0.13	<0.01	0.09	0.59	<0.05	<0.05
							0.49	L	46	45.9	0.21	0.10	3.81	<0.2	<0.05
							0.49	M	4.1	0.14	<0.01	0.10	0.48	<0.05	<0.05
							0.57	L	46	34.2	0.38	0.08	5.55	<0.2	<0.05
							0.57	M	4.0	0.16	<0.01	0.09	0.73	<0.05	<0.05
							0.57	L	32	25.6	0.17	0.11	2.99	<0.2	<0.05
							0.57	M	4.2	0.21	<0.01	0.13	0.54	<0.05	<0.05
							0.67	L	38	16.5	0.08	0.02	2.52	<0.2	<0.05
							0.67	M	3.7	0.15	<0.01	0.06	0.76	<0.05	<0.05

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

SPECIES			REGION=FLIN FLOW			DISTANCE (km) FROM SHELTER=5		LAKE=DOUGLAS LAKE						
FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC		
NORTHERN PIKE														
14	FEMALE	565	1202	0.67	L	31	16.2	0.10	0.04	2.52	<0.2	<0.05		
15	FEMALE	502	695	0.55	M	4.2	0.16	<0.01	0.07	0.66	<0.05	<0.05		
16	UNKNOWN	375	370	0.70	L	51	31.4	0.13	0.06	4.01	<0.2	<0.05		
17	FEMALE	484	732	0.65	M	3.7	0.14	<0.01	0.07	0.65	<0.05	<0.05		
1	FEMALE	365	655	1.35	L	65	59.7	0.10	0.08	3.56	<0.2	<0.05		
2	FEMALE	406	905	1.35	M	3.8	0.14	<0.01	0.04	0.72	<0.05	<0.05		
3	FEMALE	436	1080	1.29	L	27	15.5	0.12	0.04	2.91	<0.2	<0.05		
4	MALE	350	605	1.41	M	3.6	0.16	<0.01	0.10	0.66	<0.05	<0.05		
5	FEMALE	387	805	1.39	L	47	32.2	0.17	0.01	1.99	<0.2	<0.05		
6	FEMALE	390	795	1.34	M	3.7	0.20	<0.01	0.01	1.13	<0.05	<0.05		
7	FEMALE	344	597	1.47	L	45	44.2	0.17	0.02	2.44	<0.2	0.16		
8	FEMALE	450	1280	1.40	M	3.2	0.21	<0.01	0.02	1.12	<0.05	<0.05		
9	FEMALE	417	1091	1.50	L	39	24.5	0.42	0.02	1.90	<0.2	0.06		
					M	3.9	0.19	<0.01	0.02	1.11	<0.05	<0.05		
					L	42	27.2	0.14	0.02	2.16		0.05		
					M	5.5	0.26	<0.01	0.02	0.92	<0.05	<0.05		
					L	38	30.5	0.14	0.01	1.90	<0.2	0.05		
					M	4.5	0.20	<0.01	0.01	1.40	<0.05	<0.05		
					L	43	20.3	0.32	0.02	2.23	<0.2	0.36		
					M	3.4	0.15	<0.01	0.04	1.16	<0.05	<0.05		
					L	36	20.9	0.17	0.01	2.70	<0.2	0.07		
					M	4.4	0.14	<0.01	0.01	1.24	<0.05	<0.05		
					L	34	27.6	0.72	0.02	2.16	<0.2	<0.05		
					M	3.0	0.14	<0.01	0.02	0.90	<0.05	<0.05		
					L	26	18.6	0.51	0.02	2.68	<0.2			
					M	3.2	0.12	<0.01	0.03	1.15	<0.05	<0.05		

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=FLIN FLON DISTANCE (km) FROM SMELTER=5 LAKE=DOUGLAS LAKE										-----			
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	10	MALE	402	949	1.46	L	46	42.3	0.53	0.04	3.04	<0.2	0.08
						M	3.2	0.16	<0.01	0.06	1.29	<0.06	<0.05
	11	FEMALE	395	900	1.46	L	31	21.6	0.26	<0.01	2.41	<0.2	<0.05
						M	3.0	0.16	<0.01	0.02	1.44	<0.06	<0.05
	12	FEMALE	393	925	1.52	L	44	32.0	0.74	0.01	3.06	<0.2	0.22
						M	3.2	0.34	<0.01	0.03	1.39	<0.06	<0.05
	13	FEMALE	430	1022	1.29	L	37	26.4	0.36	0.02	2.25	0.2	0.08
						M	3.5	0.12	<0.01	0.03	1.28	<0.05	<0.05
	14	FEMALE	372	773	1.50	L	30	23.6	0.12	0.01	1.81	<0.2	0.07
						M	4.1	0.12	<0.01	0.02	1.23	<0.05	<0.05
	15	MALE	433	575	0.71	L	43	33.7	0.14	0.03	2.09	<0.2	0.18
						M	4.1	0.12	<0.01	0.02	1.27	<0.05	<0.05
	16	MALE	375	798	1.51	L	54	42.8	0.28	0.03	2.06	<0.2	<0.05
						M	3.1	0.15	<0.01	0.04	1.38	<0.05	<0.05
	17	FEMALE	385	770	1.35	L	39	27.5	0.13	0.01	1.93	<0.2	<0.05
						M	4.5	0.22	<0.01	0.01	1.21	<0.06	<0.05
	18	UNKNOWN	222	150	1.37	L				0.02			
						M	4.9	0.20	<0.01	<0.01	1.06	<0.05	<0.05

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

SPECIES		REGION=FLIN FLOW			DISTANCE (km) FROM SMELTER=5		LAKE=PHANTOM LAKE					
FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE												
1	FEMALE	598	1315	0.81	L	83	10.7	0.08	0.04	2.17	<0.1	<0.02
2	FEMALE	543	1239	0.77	M	6.4	0.13	<0.01	0.09	0.55	<0.05	<0.01
3	FEMALE	440	660	0.77	L	54	5.8	0.12	0.03	2.28	<0.1	<0.02
4	FEMALE	550	1330	0.80	M	9.1	0.13	<0.01	0.08	0.77	<0.05	<0.01
5	FEMALE	435	671	0.82	L	85	6.3	<0.01	0.02	2.30	<0.1	0.02
6	FEMALE	670	2054	0.66	M	8.8	0.12	<0.01	0.04	0.71	<0.05	<0.01
7	FEMALE	590	1538	0.75	L	46	11.5	0.08	0.04	2.26	<0.2	0.07
8	FEMALE	900	5673	0.81	M	12.7	0.12	<0.01	0.06	0.42	<0.05	<0.01
1	FEMALE	388	798	1.37	L	67	8.7	0.11	0.03	3.06	<0.2	0.02
2	MALE	394	873	1.43	M	4.3	0.12	<0.01	0.04	0.58	<0.05	<0.01
3	FEMALE	377	762	1.42	L	41	6.7	0.28	0.04	1.52	<0.1	<0.02
4	FEMALE	395	860	1.40	M	15.9	0.14	<0.01	0.13	0.60	<0.05	<0.01
5	MALE	381	812	1.47	L	59	7.0	0.13	0.04	1.77	<0.1	<0.02
WHITE SUCKER												
1	FEMALE	388	798	1.37	M	12.5	0.14	<0.01	0.09	0.51	<0.05	<0.01
2	MALE	394	873	1.43	L	55	4.0	0.27	0.07	2.06	<0.1	<0.02
3	FEMALE	377	762	1.42	M	9.2	0.12	<0.01	0.22	0.68	<0.05	<0.01
4	FEMALE	395	860	1.40	L	32	19.9	0.19	0.01	0.72	0.2	<0.02
5	MALE	381	812	1.47	M	6.2	0.28	<0.01	<0.01	0.68	<0.05	0.02
1	FEMALE	388	798	1.37	L	36	18.0	0.10	0.01	1.03	<0.1	0.03
2	MALE	394	873	1.43	M	3.8	0.27	<0.01	0.01	0.68	<0.05	0.02
3	FEMALE	377	762	1.42	L	28	11.2	0.12	<0.00	1.14	0.2	0.03
4	FEMALE	395	860	1.40	M	5.9	0.44	<0.01	<0.01	0.55	<0.05	0.02
5	MALE	381	812	1.47	L	39	12.1	0.10	0.005	1.17	0.2	0.02
1	FEMALE	388	798	1.37	M	6.2	0.41	<0.01	0.02	0.50	<0.05	0.04
2	MALE	394	873	1.43	L	36	18.7	0.18	0.01	1.61	0.2	<0.02
3	FEMALE	377	762	1.42	M	7.8	0.34	<0.01	0.01	0.56	<0.05	0.02

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=FLIN FLOM DISTANCE (km) FROM SMELTER=5 LAKE=PHANTOM LAKE													
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	6	FEMALE	364	725	1.50	L	41	19.5	0.08	0.02	1.12	0.2	0.05
						M	5.5	0.22	<0.01	0.01	0.59	<0.05	0.03
	7	FEMALE	372	830	1.61	L	49	33.2	0.18	0.04	1.29	<0.1	0.04
						M	6.1	0.18	<0.01	0.01	0.77	<0.05	0.04
	8	FEMALE	401	980	1.52	L	20	10.9	0.05	0.01	1.34	0.3	0.12
						M	4.2	0.24	<0.01	0.01	0.59	<0.05	0.04
	9	UNKNOWN	347	610	1.46	L	34	9.3	0.16	0.01	0.80	0.4	0.23
						M	6.8	0.34	<0.01	0.02	0.62	<0.05	0.02
	10	FEMALE	392	910	1.51	L	24	9.0	0.15	0.02	1.08	<0.2	0.08
						M	4.5	0.18	<0.01	0.01	0.68	<0.05	0.04
	11	FEMALE	370	779	1.54	L	32	12.9	0.06	0.008	1.34	<0.1	<0.02
						M	7.1	0.26	<0.01	0.01	0.77	<0.05	0.04
	12	FEMALE	410	1030	1.49	L	32	11.9	0.08	0.01	1.34	<0.1	<0.02
						M	4.4	0.19	<0.01	0.02	0.85	<0.05	0.02
	13	FEMALE	400	950	1.48	L	33	11.1	0.06	0.03	1.22	<0.1	<0.02
						M	4.1	0.17	<0.01	0.01	0.72	<0.05	0.02
14	UNKNOWN	379	775	1.42	L	32	13.0	0.12	0.13	1.28	<0.2	<0.02	
					M	4.4	0.25	<0.01	<0.01	0.61	<0.05	0.03	
15	FEMALE	402	970	1.49	L	20	6.0	0.11	0.006	1.13	<0.2	<0.02	
					M	4.5	0.21	<0.01	<0.01	0.74	<0.05	0.02	
16	FEMALE	376	888	1.67	L	33	12.7	0.15	0.01	1.28	<0.1	<0.02	
					M	3.7	0.20	<0.01	0.01	0.65	<0.05	0.03	

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

----- REGION=FLIN FLOW DISTANCE (km) FROM SMELTER=3 LAKE=CLIFF LAKE -----													
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	1	UNKNOWN	245	102	0.69	L	108	5.0	0.29	0.04	2.04		<0.03
						M	6.8	0.18	0.01	0.007	1.64	<0.02	0.02
	2	UNKNOWN	254	112	0.68	L	154.0	3.5	0.22	0.05	1.43		<0.03
						M	6.0	0.12	<0.01	0.01	1.70	<0.02	0.06
	3	UNKNOWN	250	100	0.64	L	120.0	5.1	0.41	0.08	1.96		<0.03
						M	7.1	0.16	0.01	0.01	1.72	<0.02	0.04
	4	UNKNOWN	253	133	0.82	L	94	6.7	0.45	0.02	2.10		0.05
						M	5.6	0.18	<0.01	0.02	1.60	<0.02	0.05
	5	UNKNOWN	259	132	0.76	L	99	7.4	0.29	0.07	1.84		<0.03
						M	4.3	0.13	<0.01	0.01	1.50	<0.02	0.04
	6	UNKNOWN	240	107	0.77	L	132.0	4.7	0.39	0.04	2.30		<0.03
WHITE SUCKER	7	MALE	455	665	0.71	L	120.0	12.1	1.0	0.05	1.53	<0.1	0.01
						M	5.2	0.13	0.02	0.07	1.42	<0.02	0.05
	8	FEMALE	393	479	0.79	L	60	12.8	0.49	0.03	2.25	<0.1	0.05
						M	4.8	0.12	0.01	0.04	1.72	<0.02	0.04
	9	MALE	397	511	0.82	L	53	6.1	0.23	0.02	2.86	<0.1	0.08
						M	6.8	0.15	<0.01	0.02	1.70	<0.02	0.04
	10	FEMALE	413	576	0.82	L	36	12.3	0.41	0.02	2.60	<0.1	0.04
						M	3.9	0.12	0.01	0.04	1.89	<0.02	0.03
	11	FEMALE	521	1040	0.74	L	53	12.3	1.6	0.04	2.82		0.02
						M	7.5	0.23	0.02	0.14	1.28	<0.02	0.01
	1	FEMALE	442	1229	1.42	L	57	30.8	1.3	0.04	3.48	<0.1	0.13
					M	4.1	0.18	<0.01	0.03	2.04	<0.02	0.04	
2	FEMALE	428	1170	1.49	L	55	23.4	0.62	0.04	3.01	<0.1	0.12	
					M	4.0	0.29	<0.01	0.03	1.83	<0.02	0.04	

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

----- REGION=FLIN FLO														DISTANCE (km) FROM SMELTER=6				LAKE=CLIFF LAKE			
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC								
WHITE SUCKER	3	FEMALE	405	962	1.45	L	64	20.7	0.65	0.04	2.91	<0.1	0.26								
						M	4.8	0.33	<0.01	0.04	1.80	<0.02	0.06								
	4	FEMALE	361	720	1.53	L	41	14.9	0.15	0.02	2.99		0.02								
						M	7.9	0.19	<0.01	0.009	1.2	<0.02	0.04								
	5	UNKNOWN	229	150	1.25	L	77	12.6	0.29	0.09	2.2		0.64								
						M	5.8	0.24	<0.01	0.01	1.72	<0.02	0.03								
	6	FEMALE	436	1185	1.43	L	35	17.4	0.26	0.02	2.58	<0.1	0.11								
						M	4.1	0.16	<0.01	0.01	1.80	<0.02	0.04								
	7	FEMALE	373	776	1.50	L	66	24.0	0.20	0.03	3.25	<0.1	<0.02								
						M	6.0	0.26	<0.01	0.006	1.65	<0.02	0.03								
	8	MALE	312	470	1.55	L	61	26.6	0.44	0.03	4.69	<0.1	0.23								
						M	8.4	0.22	<0.01	0.009	1.49	<0.02	0.05								
	9	FEMALE	481	1458	1.31	L	39	18.9	1.4	0.02	2.90	<0.1	0.14								
						M	6.0	0.28	<0.01	0.02	1.93	<0.02	0.06								
	10	FEMALE	378	710	1.31	L	47	18.3	0.35	0.03	4.10	<0.1	0.15								
						M	8.0	0.22	<0.01	0.01	1.74	<0.02	0.06								
11	UNKNOWN	185	77	1.22	L						1.35	<0.02	0.09								
					M	8.0	0.23	<0.01	0.01		3.17	<0.1	0.34								
12	FEMALE	347	625	1.50	L	66	14.4	0.28	0.05		1.57	<0.02	0.05								
					M	7.6	0.18	<0.01	0.009		2.50	<0.1	0.17								
13	FEMALE	458	1333	1.39	L	31	9.7	0.31	0.02		1.62	<0.02	<0.01								
					M	4.7	0.27	<0.01	0.03		3.81	<0.1	0.16								
14	UNKNOWN	297	373	1.42	L	63	35.3	0.28	0.02		1.85	<0.02	0.06								
					M	7.3	0.25	<0.01	0.01		2.60	<0.1	0.20								
15	FEMALE	347	655	1.57	L	17	10.1	0.20	0.02		1.69	<0.02	0.07								
					M	6.3	0.25	<0.01	0.02												

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

SPECIES	FISH NO.	SEX	REGION=FLIN FLOW			WEIGHT (GM)	CONDITION FACTOR	DISTANCE (km) FROM SHELTER=8			LAKE-MERIDIAN LAKE				
			LENGTH (CM)	FLIN	FLOW			TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	1	FEMALE	630			1524	0.61	L	26	11.6	0.40	0.09	2.68	<0.2	<0.05
	2	FEMALE	563			1030	0.58	M	3.5	0.21	<0.01	0.15	0.66	<0.05	<0.05
	3	FEMALE	533			1070	0.71	L	97	33.2	1.27	0.15	4.03	<0.2	<0.05
	4	FEMALE	508			672	0.51	M	5.0	0.17	<0.01	0.15	0.65	<0.05	<0.05
	5	FEMALE	467			670	0.66	L	35	10.8	0.61	0.08	2.83	<0.2	<0.05
	6	UNKNOWN	345			245	0.60	M	3.6	0.16	<0.01	0.17	0.71	<0.05	<0.05
	7	UNKNOWN	324			228	0.67	L	44	18.6	1.52	0.17	2.94	<0.2	<0.05
	8	FEMALE	485			795	0.70	M	4.7	0.17	<0.01	0.24	0.55	<0.05	<0.05
	9	FEMALE	464			645	0.65	L	66	13.8	0.24	0.04	1.94	<0.2	<0.05
	10	FEMALE	502			800	0.63	M	3.7	0.16	<0.01	0.05	0.69	<0.05	<0.05
	11	FEMALE	428			509	0.65	L	62	11.0	0.11	0.03	2.06	<0.2	<0.05
	12	MALE	442			570	0.66	M	4.8	0.14	<0.01	0.04	0.56	<0.05	<0.05
	13	UNKNOWN	382			370	0.66	L				0.02	1.83		<0.05
								M	5.1	0.18	<0.01	0.04	0.80	<0.05	<0.05
								L	22	7.0	0.17	0.05	2.15	<0.2	<0.05
								M	4.2	0.15	<0.01	0.09	0.54	<0.05	<0.05
								L	65	15.8	0.95	0.10	2.25	<0.2	<0.05
								M	4.5	0.12	<0.01	0.17	0.53	<0.05	<0.05
								L	40	35.3	0.88	0.12	2.84	<0.2	<0.05
								M	4.1	0.16	<0.01	0.23	0.59	<0.05	<0.05
								L	63	31.2	0.41	0.04	3.21	<0.2	<0.05
								M	4.3	0.16	<0.01	0.06	0.64	<0.05	<0.05
								L	29	8.0	0.41	0.06	2.17	<0.2	<0.05
								M	3.6	0.18	<0.01	0.10	0.59	<0.05	<0.05
								L	45	9.2	0.50	0.04	2.61	<0.2	<0.05
								M	3.5	0.18	<0.01	0.05	0.65		<0.05

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

IN MICROGRAMS PER GRAM OF TISSUE													
REGION=PLAIN FLOW				DISTANCE (km) FROM SHELTER=8				LAKE=MERIDIAN LAKE					
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	1	FEMALE	402	1100	1.69	L	49	33.8	0.23	0.03	3.08	<0.2	0.06
						M	3.2	0.20	<0.01	0.03	0.44	<0.05	<0.05
	2	MALE	360	675	1.45	L	46	26.1	0.12	0.02	2.22	<0.2	<0.05
						M	2.9	0.21	<0.01	0.01	0.31	<0.05	<0.05
	3	FEMALE	422	1045	1.39	L	44	20.9	0.60	0.02	1.96	<0.2	0.05
						M	3.7	0.23	<0.01	0.04	0.35	<0.05	<0.05
	4	FEMALE	492	1669	1.42	L	46	33.0	0.30	0.05	1.77	<0.2	<0.05
						M	3.1	0.24	<0.01	0.03	0.30	<0.05	<0.05
	5	FEMALE	403	839	1.28	L	38	6.8	0.18	0.03	3.06	<0.2	0.10
						M	5.5	0.29	<0.01	0.06	0.61	<0.05	<0.05
	6	FEMALE	430	1082	1.36	L	49	26.3	0.21	0.02	2.17	<0.2	0.22
						M	4.2	0.31	<0.01	0.05	0.46	<0.05	<0.05
	7	FEMALE	374	740	1.41	L	38	15.9	0.13	0.02	2.03	<0.2	<0.05
					M	3.6	0.27	<0.01	0.02	0.44	<0.05	<0.05	
8	FEMALE	325	455	1.33	L					<0.01			<0.05
					M	3.8	0.24	<0.01	<0.01	0.36	<0.05	<0.05	<0.05
9	MALE	317	461	1.45	L					<0.01			<0.05
					M	3.4	0.22	<0.01	<0.01	0.44	<0.05	<0.05	<0.05
10	FEMALE	394	758	1.24	L	52	27.0	0.11	0.03	1.60	<0.2	0.19	<0.05
					M	3.2	0.26	<0.01	0.02	0.57	<0.05	<0.05	<0.05
11	FEMALE	460	1310	1.35	L	59	34.6	0.58	0.05	2.83	<0.2	<0.05	<0.05
					M	3.7	0.16	<0.01	0.05	0.48	<0.05	<0.05	<0.05
12	FEMALE	295	360	1.40	L					0.01			<0.05
					M	4.1	0.26	<0.01	<0.01	0.58	<0.05	<0.05	<0.05
13	FEMALE	286	355	1.52	L					0.02			<0.05
					M	5.7	0.24	<0.01	<0.01	0.44	<0.05	<0.05	<0.05

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=FLIN FLOM DISTANCE (km) FROM SMELTER=8 LAKE=MERIDIAN LAKE													
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	14	UNKNOWN	369	660	1.31	L				0.03			
						M	4.6	0.30	<0.01	0.02	0.87	<0.05	<0.05
	15	FEMALE	446	1121	1.26	L	39	17.5	0.42	0.04	1.89	<0.2	0.06
						M	3.7	0.36	<0.01	0.04	0.70	<0.05	<0.05
	16	MALE	358	732	1.60	L	40	18.0	0.10	0.02		<0.2	
						M	4.4	0.21	<0.01	0.02	0.46	<0.05	<0.05
	17	FEMALE	420	1070	1.44	L				0.02	1.22		<0.05
						M	3.4	0.25	<0.01	0.02	0.33	<0.05	<0.05
18	MALE	400	851	1.33	L	58	31.9	0.14	0.03	2.87	<0.2	0.06	
					M	3.7	0.22	<0.01	0.02	0.30	<0.05	<0.05	

----- REGION=MANITOBA DISTANCE (km) FROM SMELTER=23 LAKE=CLEAVER LAKE -----													
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	1	UNKNOWN	320	269	0.82	L	51	5.5	0.06	0.07	0.89		
						M	3.7	0.15	<0.01	0.09	0.26		<0.05
	2	FEMALE	374	319	0.61	L	41	10.6	0.10	0.02	1.20		
						M	4.3	0.16	<0.01	0.12	0.21		<0.05
	3	UNKNOWN	334	280	0.75	L	53	8.2	0.04	0.03	1.07		
						M	4.2	0.13	<0.01	0.07	0.26		<0.05
	4	FEMALE	373	373	0.72	L	60	14.2	0.08	0.05	1.21		<0.05
						M	4.0	0.14	<0.01	0.08	0.17		<0.05
	5	FEMALE	529	925	0.62	L	47	20.3	0.37	0.19	1.66		<0.05
						M	10.6	0.16	<0.01	0.37	0.22		<0.05
	6	UNKNOWN	436	602	0.72	L	32	11.9	0.13	0.06	1.26		<0.05
						M	3.2	0.16	<0.01	0.18	0.25		<0.05

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

----- REGION=MANITOBA														LAKE=CLEAVER LAKE -----													
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC														
NORTHERN PIKE	7	FEMALE	503	947	0.74	L	20	10.8	0.29	0.08	1.38		<0.05														
						M	3.8	0.18	<0.01	0.25	0.29		<0.05														
	8	MALE	474	728	0.68	L	48	7.7	0.27	0.10	1.88		<0.05														
						M	5.4	0.15	<0.01	0.26	0.26		<0.05														

REGION=MANITOBA					DISTANCE (km)		FROM SMELTER=27								LAKE=NAOSAP MUD LAKE			
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC					
NORTHERN PIKE	1	FEMALE	540	1017	0.65	L	39	11.2	0.06	0.08	1.61		<0.05					
WHITE SUCKER	1	FEMALE	403	1095	1.67	M	4.0	0.12	<0.01	0.18	0.12		<0.05					
						L	14	5.5	0.02	<0.01	0.52		<0.05					
	2	FEMALE	345	728	1.77	M	3.2	0.31	<0.01	0.10	0.10		<0.05					
						L	15	4.7	0.02	<0.01	0.56		<0.05					
	3	FEMALE	374	887	1.70	M	2.9	0.24	<0.01	0.02	0.14		<0.05					
						L	17	5.90	0.03	0.03	0.56		<0.05					
	4	FEMALE	392	935	1.55	M	3.6	0.30	<0.01	0.08	0.12		<0.05					
						L	14	4.3	0.02	0.02	0.52		<0.05					
	5	MALE	357	839	1.84	M	3.1	0.22	<0.01	0.06	0.11		<0.05					
						L	16	5.4	0.03	0.04	0.75		<0.05					
	6	FEMALE	390	949	1.60	M	2.5	0.22	<0.01	0.07	0.11		<0.05					
						L	18	6.8	0.03	0.06	0.70		<0.05					
	7	FEMALE	362	784	1.65	M	2.7	0.22	<0.01	0.06	0.14		<0.05					
						L	19	6.5	0.02	0.01	0.55		<0.05					
	8	MALE	380	756	1.38	M	3.7	0.24	<0.01	0.03	0.12		<0.05					
						L	19	5.0	0.04	0.02	0.55		<0.05					
						M	3.0	0.27	<0.01	0.11	0.10		<0.05					

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=MANITOBA				DISTANCE (km) FROM SHELTER=27		LAKE=NAOSAP MUD LAKE							
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	9	FEMALE	345	633	1.54	L	15	5.1	<0.01	0.03	0.61		<0.05
						M	3.4	0.30	<0.01	0.03	0.11		<0.05
	10	FEMALE	420	1170	1.58	L	17	5.0	0.02	0.04	0.59		<0.05
						M	3.3	0.31	<0.01	0.04	0.12		<0.05
	11	MALE	335	563	1.50	L	15	2.1	0.05	0.01	0.51		<0.05
						M	2.8	0.20	<0.01	0.05	0.12		<0.05
	12	MALE	339	617	1.58	L	14	3.5	0.02	0.03	0.53		<0.05
						M	3.1	0.24	<0.01	0.03	0.11		<0.05
	13	MALE	355	598	1.34	L	12	3.0	0.03	0.03	0.48		<0.05
						M	3.6	0.27	<0.01	0.06	0.11		<0.05
	14	FEMALE	365	763	1.61	L	13	2.5	<0.01	0.02	0.39		<0.05
						M	3.4	0.45	<0.01	0.02	0.11		<0.05
	15	FEMALE	396	989	1.57	L	16	4.8	0.03	0.02	0.56		<0.05
						M	3.4	0.38	<0.01	0.06	0.15		<0.05
	16	FEMALE	380	874	1.59	L	22	6.6	0.02	0.03	0.67		<0.05
						M	2.7	0.23	<0.01	0.04	0.14		<0.05

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

SPECIES		FISH NO. SEX		REGION=MANITOBA		DISTANCE (km) FROM SMELTER=30		LAKE=KOTYK LAKE						
				LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE		1	UNKNOWN	423	529	0.70	L	82	8.6	0.03	0.04	1.14	<0.05	0.05
		2	UNKNOWN	510	755	0.57	M	3.5	0.11	<0.01	0.05	0.25	<0.05	<0.01
		3	UNKNOWN	405	410	0.62	L	111	21.7	0.09	0.03	1.73	<0.05	<0.02
		4	UNKNOWN	377	393	0.73	M	4.6	0.13	<0.01	0.14	0.26	<0.05	<0.01
		5	FEMALE	595	1349	0.64	L	58	10.0	0.03	0.14	1.27	<0.05	0.02
		6	FEMALE	510	884	0.65	M	4.2	0.12	<0.01	0.06	0.29	<0.05	<0.01
		7	FEMALE	504	739	0.58	L	106	7.9	0.03	0.11	1.01	<0.05	<0.02
		8	UNKNOWN	390	428	0.72	M	5.0	0.18	<0.01	0.05	0.27	<0.05	<0.01
		9	FEMALE	575	1066	0.56	L	71	13.2	0.04	0.05	1.08	<0.05	0.04
		10	FEMALE	540	775	0.49	M	4.7	0.11	<0.01	0.13	0.27	<0.05	<0.01
		11	FEMALE	532	967	0.64	L	87	16.9	0.05	0.07	1.50	<0.05	0.07
		12	FEMALE	588	1305	0.64	M	4.4	0.11	<0.01	0.11	0.30	<0.05	<0.01
		13	FEMALE	556	1048	0.61	L	110	16.1	0.05	0.06	1.15	<0.05	0.06
							M	5.1	0.08	<0.01	0.14	0.28	<0.05	<0.01
							L	70	8.3	0.04	0.04	1.27	<0.05	0.07
							M	5.2	0.10	<0.01	0.07	0.26	<0.05	0.02
							L	100	27.4	0.16	0.14	1.31	<0.05	<0.02
							M	4.8	0.09	<0.01	0.26	0.27	<0.05	<0.01
							L	73	28.5	0.12	0.17	1.06	<0.05	<0.02
							M	4.1	0.10	<0.01	0.34	0.23	<0.05	<0.01
							L	69	24.6	0.13	0.16	1.64	<0.05	0.03
							M	4.8	0.12	<0.01	0.19	0.26	<0.05	<0.01
							L	81	19.0	0.09	0.17	1.52	<0.05	<0.02
							M	4.7	0.12	<0.01	0.25	0.23	<0.05	0.02
							L	113	14.6	0.10	0.22	1.40	<0.05	0.04
							M	5.3	0.11	<0.01	0.26	0.24	<0.05	<0.01

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

SPECIES	FISH NO.	SEX	REGION=MANITOBA	LENGTH (CM)	WEIGHT (GM)	DISTANCE (km) FROM SMELTER=30	LAKE=KOTYK LAKE	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	14	FEMALE		585	1454	0.73		L	58	8.0	0.04	0.07	1.35	<0.05	<0.02
								M	3.9	0.08	<0.01	0.20	0.30	<0.05	0.02
	15	MALE		519	928	0.66		L	76	11.8	0.07	0.11	1.42	<0.05	0.13
								M	5.7	0.11	<0.01	0.13	0.28	<0.05	<0.01
	16	UNKNOWN		450	592	0.65		L	78	11.5	0.04	0.06	1.10	<0.05	0.08
								M	4.6	0.11	<0.01	0.07	0.26	<0.05	<0.01
WHITE SUCKER	17	FEMALE		440	635	0.75		L	109	15.1	0.03	0.05	1.08	<0.05	0.02
								M	4.5	0.10	<0.01	0.08	0.20	<0.05	<0.01
	1	FEMALE		426	1088	1.41		L	22.4	7.2	0.02	0.04	0.79	0.22	<0.01
								M	2.0	0.28	<0.01	0.10	0.24	<0.05	<0.01
	2	FEMALE		418	1098	1.50		L	20.7	7.0	0.01	0.04	0.81	0.33	<0.01
								M	2.6	0.28	<0.01	0.04	0.55	<0.05	<0.01
	3	FEMALE		396	902	1.45		L	21.4	5.7	0.01	0.04	0.73	0.28	0.01
								M	2.4	0.23	<0.01	0.05	0.34	<0.05	<0.01
	4	FEMALE		448	594	0.66		L	14.9	3.6	0.01	0.01	0.39	0.27	<0.01
								M	3.0	0.44	<0.01	0.03	0.45	<0.05	0.02
	5	UNKNOWN		267	267	1.40		L	19.2	2.8	0.01	0.02	0.44	0.81	<0.01
								M	2.3	0.18	<0.01	0.01	0.37	<0.05	0.02
	6	FEMALE		430	1058	1.33		L	23.7	6.3	0.02	0.02	0.68	0.32	0.01
								M	2.9	0.30	<0.01	0.06	0.51	<0.05	<0.01
	7	FEMALE		408	1012	1.49		L	23.4	6.9	0.02	0.02	0.81	0.23	0.01
								M	2.8	0.35	<0.01	0.04	0.23	<0.05	<0.01
	8	FEMALE		379	901	1.66		L	19.2	7.8	0.01	0.04	0.68	0.36	0.01
								M	3.3	0.37	<0.01	0.05	0.25	<0.05	<0.01
	9	MALE		376	657	1.24		L	16.6	3.2	0.01	0.04	0.72	0.26	<0.01
								M	3.0	0.41	<0.01	0.04	0.30	<0.05	<0.01

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=MANITOBA				DISTANCE (km) FROM SMELTER=30			LAKE=KOTYK LAKE						
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	10	FEMALE	311	444	1.48	L	24.2	2.6	<0.01	0.03	0.65	0.31	0.02
						M	2.3	0.14	<0.01	0.02	0.25	<0.05	<0.01
	11	FEMALE	357	675	1.48	L	16.9	3.9	<0.01	0.03	0.65	0.40	0.02
						M	2.3	0.19	<0.01	0.02	0.26	<0.05	<0.01
	12	MALE	375	696	1.32	L	17.0	2.1	<0.01	0.03	0.39	0.44	0.02
						M	2.1	0.23	<0.01	0.04	0.57	<0.05	<0.01
	13	MALE	402	902	1.39	L	20.0	6.3	<0.01	0.02	0.37	0.29	0.01
						M	2.4	0.30	<0.01	0.05	0.35	<0.05	0.02
	14	FEMALE	405	939	1.41	L	27.3	6.7	0.01	0.02	0.76	0.23	0.02
						M	2.7	0.18	<0.01	0.04	0.33	<0.05	<0.01
	15	FEMALE	381	791	1.43	L	18.8	2.6	<0.01	0.02	0.66	0.20	0.02
						M	2.4	0.27	<0.01	0.03	0.32	<0.05	<0.01
	16	MALE	370	738	1.46	L	21.6	5.4	0.01	0.02	0.48	0.20	0.05
						M	2.7	0.33	<0.01	0.08	0.38	<0.05	<0.01
	17	FEMALE	409	1060	1.55	L	23.0	6.2	<0.01	0.03	0.78	0.10	0.01
						M	3.1	0.34	<0.01	0.04	0.24	<0.05	<0.01
	18	FEMALE	393	871	1.43	L	19.6	2.7	<0.01	0.06	0.71	0.19	0.01
						M	2.5	0.19	<0.01	0.04	0.35	<0.05	<0.01

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

SPECIES		REGION=MANITOBA			DISTANCE (km) FROM SMELTER=43			LAKE=NEKIK LAKE				
FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE												
1	FEMALE	885	2323	0.72	L	57	8.7		0.30	1.93	<0.1	<0.02
2	FEMALE	710	2361	0.66	M	3.8	0.09	<0.01	0.36	0.15	<0.02	0.02
3	FEMALE	526	952	0.65	L	38	6.9	0.02	0.24	1.13	<0.1	<0.02
4	FEMALE	497	1007	0.82	M	3.9	0.11	<0.01	0.17	0.19	<0.02	0.02
5	MALE	543	1004	0.63	L	93	22.5	0.05	0.20	1.66	<0.1	0.02
6	FEMALE	562	1324	0.75	M	4.0	0.11	<0.01	0.18	0.18	<0.02	0.01
7	FEMALE	439	607	0.72	L	50	8.3	<0.02	0.10	1.27	<0.1	0.06
8	FEMALE	541	1044	0.66	M	4.1	0.13	<0.01	0.12	0.17	<0.02	0.01
9	FEMALE	530	1032	0.69	L	44	25.0	0.03	0.44	1.56	<0.1	<0.02
10	FEMALE	532	973	0.65	M	2.8	0.11	<0.01	0.28	0.20	<0.02	<0.01
1	UNKNOWN	155	51	1.37	L	39	9.2	<0.02	0.12	1.31	<0.1	<0.02
2	UNKNOWN	162	52	1.22	M	4.1	0.12	<0.01	0.19	0.18	<0.02	<0.01
3	UNKNOWN	189	104	1.54	L	53	21.6	0.02	0.24	2.06	<0.1	<0.02
					M	3.3	0.09	<0.01	0.18	0.18	<0.02	<0.01
					L	56	15.9	0.02	0.15	1.09	<0.1	<0.02
					M	3.3	0.10	<0.01	0.21	0.18	<0.02	<0.01
					L	36	8.0	<0.02	0.14	1.57	<0.1	<0.02
					M	2.8	0.13	<0.01	0.18	0.21	<0.02	<0.01
					L	60	25.5	0.05	0.19	2.04	<0.1	<0.02
					M	4.6	0.11	<0.01	0.17	0.17	<0.02	<0.01
					L							
					M	4.1	0.27	<0.01	0.02	0.25	<0.02	<0.01
					L							
					M	3.9	0.22	<0.01	0.02	0.23	<0.02	0.01
					L	24						
					M	3.2	0.18	<0.01	0.01	0.19	<0.02	0.01

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=MANITOBA										LAKE=NEKIK LAKE									
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC						
WHITE SUCKER	4	UNKNOWN	170	73	1.49	L													
						M	4.1	0.18	<0.01	0.02	0.18	<0.02	0.02						
	5	UNKNOWN	164	60	1.38	L													
						M	3.8	0.17	<0.01	0.02	0.18	<0.02	0.01						
	6	FEMALE	399	946	1.49	L	48	4.4	0.08	0.08	0.74	<0.1	<0.02						
						M	2.8	0.22	<0.01	0.08	0.19	<0.02	<0.01						
	7	FEMALE	344	657	1.61	L	15	3.0	0.05	0.02	0.84	<0.1	0.16						
						M	2.9	0.28	<0.01	0.08	0.24	<0.02	0.02						
	8	FEMALE	299	468	1.75	L	13	4.2	0.04	0.05	0.19	<0.1	0.03						
						M	3.0	0.24	<0.01	0.02	0.23	<0.02	0.02						
	9	FEMALE	343	653	1.62	L	20	3.3	0.04	0.02	0.62	<0.1	0.06						
						M	2.6	0.18	<0.01	0.03	0.18	<0.02	0.02						
	10	FEMALE	336	633	1.67	L	23	8.3	0.08	0.04	0.64	<0.1	<0.02						
						M	2.9	0.12	<0.01	0.04	0.18	<0.02	0.02						

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REGION=SASKATCHEWAN										LAKE=SASK LAKE NO.1									
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC						
NORTHERN PIKE	1	FEMALE	498	899	0.73	L	92	6.9	0.04	0.12	1.35	<0.2	<0.05						
						M	7.4	0.19	<0.01	0.23	0.23	<0.05	<0.05						
	2	FEMALE	540	1050	0.67	L	41	27.9	0.15	0.18	1.64	<0.2	<0.05						
						M	4.0	0.17	<0.01	0.24	0.13	<0.05	<0.05						
	3	FEMALE	543	950	0.59	L	58	40.0	0.11	0.19	1.40	<0.2	<0.05						
						M	4.9	0.19	<0.01	0.26	0.13	<0.05	<0.05						
	4	FEMALE	425	525	0.68	L	70	7.5	0.01	0.06	1.05	<0.2	<0.05						
						M	4.0	0.17	<0.01	0.08	0.09	<0.05	<0.05						

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

----- REGION=SASKATCHEWAN													DISTANCE (km) FROM SMELTER=68			LAKE=SASK LAKE NO.1			-----		
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC								
NORTHERN PINE	5	FEMALE	508	1010	0.77	L	59	7.9	0.02	0.13	1.84	<0.2	<0.05								
						M	5.8	0.24	<0.01	0.20	0.14	0.06	<0.05								
	6	FEMALE	501	790	0.83	L	44	9.8	0.04	0.08	1.81	<0.2	<0.05								
						M	4.2	0.13	<0.01	0.10	0.12	<0.05	<0.05								
	7	FEMALE	489	745	0.64	L	41	7.9	0.15	0.14	1.48	<0.2	<0.05								
						M	5.1	0.20	<0.01	0.18	0.10	<0.05	<0.05								
	8	MALE	481	739	0.66	L	33	10.1	0.03	0.15	1.52	<0.2	<0.05								
						M	4.0	0.21	<0.01	0.23	0.14	<0.05	<0.05								
	9	MALE	481	775	0.70	L	34	8.2	0.05	0.13	1.22	<0.2	<0.05								
						M	5.8	0.19	<0.01	0.20	0.20	<0.05	<0.05								
	10	MALE	487	740	0.64	L	36	11.9	0.11	0.21	1.54	<0.2	<0.05								
						M	5.7	0.16	<0.01	0.29	0.14	<0.05	<0.05								
	11	FEMALE	428	480	0.61	L	62	13.1	0.04	0.12	1.71		<0.05								
						M	4.1	0.20	<0.01	0.09	0.20	<0.05	<0.05								
	12	FEMALE	445	571	0.65	L	44	11.8	0.06	0.14	1.97	<0.2	<0.05								
						M	4.6	0.28	<0.01	0.16	0.19	<0.05	<0.05								
	13	UNKNOWN	220	67	0.63	L				0.05											
						M	5.4	0.20	<0.01	0.06	0.15	<0.05	<0.05								
	14	FEMALE	511	980	0.73	L				0.14	1.83		<0.05								
						M	5.7	0.25	<0.01	0.13	0.20	<0.05	<0.05								
WHITE SUCKER	1	UNKNOWN	113	17	1.16	L				0.15											
						M	7.8	0.46	<0.01	0.05		<0.05	<0.05								
	2	MALE	435	1167	1.44	L	18	8.7	0.10	0.06	0.93	<0.2	<0.05								
						M	3.1	0.63	<0.01	0.07	0.17	<0.05	<0.05								
	3	FEMALE	474	1510	1.42	L	18	7.6	0.05	0.05	0.95	<0.2	<0.05								
						M	2.4	0.30	<0.01	0.04	0.15	<0.05	<0.05								

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=SASKATCHEWAN				FROM SHELTER=68				LAKE=SASK LAKE NO.1					
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	4	FEMALE	370	740	1.46	L	13	2.1	<0.04	0.04	0.69	<0.2	<0.05
						M	3.5	0.36	<0.01	0.05	0.19	<0.05	<0.05
	5	FEMALE	413	970	1.38	L	16	6.9	<0.04	0.03	0.81	<0.2	<0.05
						M	2.9	0.34	<0.01	0.05	0.13	<0.05	<0.05

REGION=SASKATCHEWAN				DISTANCE (km)			LAKE=SASK LAKE NO.2						
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	1	FEMALE	547	910	0.56	L	68	26.2	0.43	1.09	2.06	<0.2	<0.05
	2	MALE	483	713	0.63	M	4.3	0.15	<0.01	0.76	0.37	<0.05	0.26
						L	85	15.2	0.19	0.32	1.66	<0.2	<0.05
	3	FEMALE	580	1225	0.63	M	7.6	0.24	<0.01	0.41	0.33	<0.05	0.07
						L	67	61.0	0.43	1.28	2.14	<0.2	<0.05
	4	FEMALE	463	627	0.63	M	5.9	0.15	<0.01	0.94	0.34	<0.05	0.14
						L	67	15.4	0.16	0.26	1.81	0.3	0.06
	5	FEMALE	559	1140	0.65	M	4.4	0.20	<0.01	0.33	0.43	<0.05	0.06
						L	67	8.9	0.36	0.90	1.73	<0.2	<0.05
	6	FEMALE	485	630	0.55	M	9.6	0.21	<0.01	0.72	0.34	<0.05	0.06
						L	60	84.4	0.84	1.76	2.60	0.2	<0.05
	7	FEMALE	495	740	0.61	M	6.7	0.13	<0.01	0.93	0.32	<0.05	<0.05
						L	64	14.9	0.22	0.61	1.50		<0.05
	8	FEMALE	549	1062	0.65	M	7.1	0.18	<0.01	0.62	0.34	<0.05	0.06
						L	38	13.1	0.25	0.63	1.26	<0.2	<0.05
	9	FEMALE	541	1130	0.71	M	7.4	0.28	<0.01	0.79	0.38	<0.05	0.05
						L	44		0.14	0.38	1.85	<0.2	<0.05
						M	9.5	0.31	<0.01	0.58	0.41	<0.05	0.18

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=SASKATCHEWAN				DISTANCE (km) FROM SMELTER=74		LAKE=SASK LAKE NO.2							
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	10	MALE	455	690	0.73	L	61	18.5	0.16	0.24	1.56		<0.05
	11	FEMALE	573	1182	0.63	M	4.0	0.32	<0.01	0.29	0.31	<0.05	0.08
						L	60	40.3	0.29	1.81	1.99	<0.2	<0.05
	12	MALE	480	704	0.64	M	8.4	0.16	<0.01	0.98	0.40	<0.05	<0.05
						L	67	17.0	0.16	0.36	1.33	<0.2	<0.05
	13	FEMALE	482	775	0.69	M	5.0	0.17	<0.01	0.41	0.41	<0.05	0.13
						L	85	12.5	0.16	0.35	1.58	<0.2	<0.05
	14	FEMALE	648	1445	0.53	M	6.0	0.15	<0.01	0.45	0.51	<0.05	0.08
						L	58	55.4	0.19	2.59	2.31	<0.2	<0.05
	15	UNKNOWN	545	1070	0.66	M	6.2	0.27	<0.01	1.68	0.44	<0.05	0.11
L						63	30.1	0.34	1.31	1.73	<0.2	<0.05	
16	UNKNOWN	448	405	0.45	M	5.2	0.20	<0.01	0.94	0.40	<0.05	0.10	
					L	67	9.1	0.06	0.12	1.18		<0.05	
17	FEMALE	392	390	0.65	M	4.0	0.14	<0.01	0.26	0.45	<0.05	0.08	
					L	40	9.4	0.07	0.15	0.88		<0.05	
18	FEMALE	288	352	1.47	M	3.8	0.23	<0.01	0.29	0.38	<0.05	0.09	
					L	85	12.9	0.10	0.15	1.13		<0.05	
19	FEMALE	422	390	0.52	M	3.5	0.15	<0.01	0.25	0.37	<0.05	0.06	
					L	47	13.6	0.09	0.13	1.47		<0.05	
					M	4.5	0.09	<0.01	0.29	0.40	<0.05	<0.05	

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=SASKATCHEWAN				DISTANCE (km) FROM SHELTER=83				LAKE=SASK LAKE NO.4					
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	1	FEMALE	591	1182	0.57	L	81	30.9	1.10	0.39	2.04	<0.2	<0.05
	2	FEMALE	590	1430	0.70	M	6.5	0.22	<0.01	0.27	0.27	<0.05	<0.05
	3	FEMALE	585	1120	0.56	L	54	20.0	0.53	0.25	1.68	<0.2	<0.05
	4	FEMALE	575	1311	0.69	M	6.4	0.21	<0.01	0.24	0.31	<0.05	<0.05
WHITE SUCKER	1	FEMALE	392	978	1.62	L	38	46.6	0.44	0.44	2.14	<0.2	<0.05
	2	FEMALE	372	780	1.52	M	3.3	0.16	<0.01	0.32	0.24	<0.05	<0.05
	3	FEMALE	421	1141	1.53	L	35	19.0	1.04	0.68	2.06	<0.2	<0.05
	4	FEMALE	468	1440	1.40	M	6.2	0.17	<0.01	0.34	0.22	<0.05	<0.05
	5	FEMALE	365	780	1.56	L	27	14.4	0.23	0.09	1.01	<0.2	<0.05
	6	FEMALE	418	1150	1.57	M	2.8	0.26	<0.01	0.14	0.32	<0.05	<0.05
	7	FEMALE	438	1380	1.64	L				0.05	0.80		<0.05
	8	FEMALE	439	1135	1.34	M	2.8	0.28	<0.01	0.06	0.36	<0.05	<0.05
	9	MALE	379	838	1.54	L	22	16.4	0.23	0.08	1.06	<0.2	<0.05
					M	2.9	0.28	<0.01	0.14	0.38	<0.05	<0.05	
					L	22	9.1	0.29	0.14	1.20	<0.2	<0.05	
					M	3.5	0.28	<0.01	0.34	0.29	<0.05	<0.05	
					L	28	26.5	0.21	0.06	1.06	<0.2	<0.05	
					M	2.9	0.28	<0.01	0.09	0.43	<0.05	<0.05	
					L	30	23.6	0.24	0.08	1.17	<0.2	<0.05	
					M	3.6	0.27	<0.01	0.12	0.27	<0.05	<0.05	
					L	25	17.2	0.31	0.08	0.90	<0.2	<0.05	
					M	2.6	0.23	<0.01	0.11	0.36	<0.05	<0.05	
					L	17	7.3	0.41	0.08	0.61	<0.2	<0.05	
					M	2.4	0.24	<0.01	0.21	0.23	<0.05	<0.05	
					L	26	21.3	0.30	0.03	0.70	<0.2	<0.05	
					M	2.7	0.26	<0.01	0.05	0.42	<0.05	<0.05	

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=SASKATCHEWAN DISTANCE (km) FROM SHELTER=83 LAKE=SASK LAKE NO.4													
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	10	UNKNOWN	371	750	1.47	L	27	26.0	0.32	0.06	1.10	<0.2	<0.05
						M	2.3	0.17	<0.01	0.04	0.46	<0.05	<0.05
	11	FEMALE	466	1465	1.45	L	29	22.2	0.46	0.07	0.89	<0.2	<0.05
						M	4.5	0.33	<0.01	0.06	0.32	0.06	<0.05
	12	FEMALE	423	1060	1.40	L	22	23.0	0.22	0.11	0.95	<0.2	<0.05
						M	3.0	0.35	<0.01	0.19	0.25	0.05	<0.05
	13	FEMALE	416	1150	1.60	L	27	18.7	0.20	0.08	1.38	<0.2	<0.05
						M	2.9	0.25	<0.01	0.09	0.32	0.06	<0.05
	14	FEMALE	392	929	1.54	L	22	21.0	0.18	0.07	0.84	<0.2	<0.05
						M	3.1	0.37	0.01	0.14	0.28	<0.05	<0.05
	15	FEMALE	460	1400	1.44	L	19	10.1	0.42	0.07	0.73	<0.2	<0.05
						M	2.8	0.18	<0.01	0.16	0.26	<0.05	<0.05
	16	FEMALE	360	800	1.71	L	29	21.3	0.17	0.05	1.06	<0.2	<0.05
						M	3.8	0.29	<0.01	0.08	0.29	<0.05	<0.05
	17	FEMALE	427	1125	1.45	L	32	24.8	0.38	0.05	1.03	<0.2	<0.05
						M	3.8	0.37	<0.01	0.05	0.41	<0.05	<0.05

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

REGION=SASKATCHEWAN DISTANCE (km) FROM SMELTER=84 LAKE=SASK LAKE NO.3										-----			
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
NORTHERN PIKE	1	FEMALE	513	1035	0.77	L	82	9.2	0.29	2.03	1.91	<0.2	<0.05
	2	FEMALE	470	732	0.71	M	4.2	0.31	<0.01	0.98	0.38	<0.05	<0.05
	3	FEMALE	589	1208	0.66	L	108	10.9	0.15	0.80	1.91	<0.2	<0.05
	4	FEMALE	472	676	0.64	M	7.2	0.31	<0.01	0.59	0.31	<0.05	<0.05
	5	FEMALE	495	711	0.59	L	127	17.1	0.23	0.72	1.90	<0.2	<0.05
	6	FEMALE	455	641	0.68	M	6.5	0.22	<0.01	0.62	0.33	<0.05	<0.05
	7	FEMALE	435	570	0.69	L	83	4.9	0.08	0.22	1.28	<0.2	<0.05
	8	FEMALE	411	520	0.75	M	5.6	0.29	<0.01	0.43	0.36	<0.05	<0.05
	9	FEMALE	510	1022	0.77	L	58	10.4	0.22	0.74	1.52	<0.2	<0.05
	10	FEMALE	475	630	0.59	M	6.0	0.31	<0.01	0.66	0.34	<0.05	<0.05
	11	UNKNOWN	227	75	0.64	L	121	24.0	0.19	0.45	2.26		<0.05
	12	UNKNOWN	250	90	0.58	M	6.0	0.24	<0.01	0.52	0.37	<0.05	<0.05
	13	UNKNOWN	274	137	0.67	L	102	9.9	0.12	0.30	1.72		<0.05
						M	4.3	0.21	<0.01	0.48	0.36	<0.05	<0.05
						L	124	8.8	0.08	0.18	1.60		<0.05
						M	6.1	0.28	<0.01	0.34	0.37	<0.05	<0.05
						L	53	6.0	0.09	0.28	1.68	<0.2	<0.05
						M	8.8	0.38	<0.01	0.55	0.37	<0.05	<0.05
						L	98	5.2	0.24	1.14	1.93	<0.2	<0.05
						M	7.4	0.26	<0.01	0.99	0.34	<0.05	<0.05
						L				0.14			
						M				0.17	0.26		<0.05
						L				0.10			
						M	6.2	0.29	<0.01	0.18	0.34	<0.05	<0.05
						L				0.13	0.92		<0.05
						M	5.6	0.14	<0.01	0.25	0.37	<0.05	<0.05

METAL CONCENTRATIONS IN FISH TISSUES
IN MICROGRAMS PER GRAM WET WEIGHT

----- REGION=SASKATCHEWAN DISTANCE (km) FROM SMELTER=84 LAKE=SASK LAKE NO.3 -----													
SPECIES	FISH NO.	SEX	LENGTH (CM)	WEIGHT (GM)	CONDITION FACTOR	TISSUE	ZINC	COPPER	CADMIUM	MERCURY	SELENIUM	LEAD	ARSENIC
WHITE SUCKER	1	MALE	428	1142	1.48	L	23	4.8	0.11	0.04	0.69		<0.05
						M	3.7	0.37	<0.01	0.11	0.29	<0.05	<0.05
	2	FEMALE	446	1299	1.46	L	24	8.1	0.23	0.05	0.93	<0.2	<0.05
						M	2.8	0.31	<0.01	0.12	0.31	<0.05	<0.05
	3	UNKNOWN	307	468	1.62	L				0.05			
						M	3.4	0.31	<0.01	0.09	0.26	<0.05	<0.05

Appendix 4.

Means and standard deviations of metal concentrations in liver and muscle of white sucker and northern pike from the study lakes.

Means and standard deviations of metal concentrations in fish tissues in micrograms per gram wet weight.

Lake	Species	Tissue	Zinc (mean, S.D.)	Copper (mean, S.D.)	Cadmium (mean, S.D.)	Mercury (mean, S.D.)	Selenium (mean, S.D.)	Lead (mean, S.D.)	Arsenic (mean, S.D.)							
Region- Flin Flon																
HAMELL LAKE	NORTHERN PIKE	LIVER	100	36	19.5	8.7	0.79	0.33	0.03	0.02	2.59	0.69	*	*	0.06	0.02
		MUSCLE	4.5	0.5	0.17	0.03	<0.01		0.05	0.02	1.09	0.13	<0.01	<0.01	0.02	0.01
	WHITE SUCKER	LIVER	40	11	13.4	5.8	0.51	0.30	0.01	0.01	2.13	0.37	*	*	0.15	0.19
		MUSCLE	7.4	3.0	0.26	0.07	<0.01		0.04	0.02	1.26	0.23	<0.01	<0.01	<0.01	<0.01
DOUGLAS LAKE	NORTHERN PIKE	LIVER	43	12	28.5	11.8	0.19	0.11	0.08	0.04	3.36	0.72	<0.2	<0.2	<0.05	<0.05
		MUSCLE	4.1	0.4	0.14	0.03	<0.01		0.09	0.03	0.62	0.09	<0.05	<0.05	<0.05	<0.05
	WHITE SUCKER	LIVER	40	7	29.2	7.9	0.31	0.21	0.02	0.01	2.29	0.39	<0.2	<0.2	0.09	0.09
		MUSCLE	3.8	0.7	0.18	0.06	<0.01		0.02	0.01	1.20	0.15	<0.05	<0.05	<0.05	<0.05
PHANTOM LAKE	NORTHERN PIKE	LIVER	56	9	7.6	2.5	0.13	0.09	0.04	0.01	2.18	0.45	<0.1	<0.1	0.02	0.02
		MUSCLE	9.6	3.9	0.13	0.01	<0.01		0.09	0.06	0.60	0.11	<0.05	<0.05	<0.01	<0.01
	WHITE SUCKER	LIVER	33	7	14.3	6.4	0.12	0.05	0.02	0.03	1.22	0.25	0.14	0.10	0.04	0.06
		MUSCLE	5.3	1.3	0.26	0.08	<0.01		0.01	0.01	0.65	0.08	<0.05	<0.05	0.03	0.01
CLIFF LAKE	NORTHERN PIKE	LIVER	94	38	8.0	3.6	0.53	0.41	0.04	0.02	2.16	0.47	<0.1	<0.1	0.03	0.02
		MUSCLE	5.9	1.2	0.15	0.03	0.01	0.01	0.03	0.04	1.63	0.18	<0.02	<0.02	0.04	0.01
	WHITE SUCKER	LIVER	51	17	19.8	7.6	0.48	0.40	0.03	0.02	3.16	0.68	<0.1	<0.1	0.19	0.16
		MUSCLE	6.1	1.6	0.24	0.05	<0.01		0.02	0.01	1.67	0.22	<0.02	<0.02	0.05	0.02
MERIDIAN LAKE	NORTHERN PIKE	LIVER	50	22	17.1	10.3	0.60	0.43	0.08	0.05	2.56	0.65	<0.2	<0.2	<0.05	<0.05
		MUSCLE	4.2	0.6	0.16	0.02	<0.01		0.12	0.07	0.61	0.06	<0.05	<0.05	<0.05	<0.05
	WHITE SUCKER	LIVER	47	7	24.3	8.6	0.26	0.18	0.02	0.01	2.20	0.58	<0.2	<0.2	0.07	0.07
		MUSCLE	3.9	0.8	0.25	0.05	<0.01		0.02	0.02	0.45	0.12	<0.05	<0.05	<0.05	<0.05

* no data available.

Note- For calculation of means, results reported as less than detection limit were set to 0.5 of detection limit.

Means and standard deviations of metal concentrations in fish tissues in micrograms per gram wet weight.

Lake	Species	Tissue	Zinc (mean, S.D.)	Copper (mean, S.D.)	Cadmium (mean, S.D.)	Mercury (mean, S.D.)	Selenium (mean, S.D.)	Lead (mean, S.D.)	Arsenic (mean, S.D.)
Region- Manitoba									
CLEAVER LAKE	NORTHERN PIKE	LIVER 44	13	11.2	0.17	0.12	0.08	0.05	1.28 0.25
	MUSCLE	4.9	2.4	0.15	0.02	<0.01	0.18	0.11	0.24 0.04
MAOSAP MUD LAKE	NORTHERN PIKE	LIVER 39		11.2	0.06		0.08		1.61
	(n = 1)	MUSCLE 4.0		0.12	0.01		0.18		0.12
	WHITE SUCKER	LIVER 16	3	4.8	0.02	0.01	0.02	0.01	0.57 0.09
	MUSCLE	3.2	0.4	0.28	0.07	<0.01	0.05	0.03	0.12 0.02
KOTYK LAKE	NORTHERN PIKE	LIVER 85	19	15.5	6.7	0.07	0.10	0.06	1.29 0.22
	MUSCLE	4.7	0.5	0.11	0.02	<0.01	0.15	0.09	0.26 0.03
	WHITE SUCKER	LIVER 21	3	4.9	2.0	0.01	0.03	0.01	0.64 0.15
	MUSCLE	2.6	0.4	0.28	0.09	<0.01	0.04	0.02	0.35 0.11
NEKIK LAKE	NORTHERN PIKE	LIVER 53	17	15.2	7.8	0.03	0.21	0.10	1.56 0.36
	MUSCLE	3.7	0.6	0.11	0.01	<0.01	0.20	0.07	0.18 0.02
	WHITE SUCKER	LIVER 24	13	4.6	2.1	0.05	0.04	0.02	0.55 0.21
	MUSCLE	3.3	0.6	0.21	0.05	<0.01	0.03	0.02	0.21 0.03

* no data available.

Note- For calculation of means, results reported as less than detection limit were set to 0.5 of detection limit.

Means and standard deviations of metal concentrations in fish tissues in micrograms per gram wet weight.

Lake	Species	Tissue	Zinc (mean, S.D.)	Copper (mean, S.D.)	Cadmium (mean, S.D.)	Mercury (mean, S.D.)	Selenium (mean, S.D.)	Lead (mean, S.D.)	Arsenic (mean, S.D.)					
Region- Saskatchewan														
SASK LAKE NO.1	NORTHERN PIKE	LIVER	49	13.6	10.0	0.07	0.05	0.13	0.05	1.51	0.24	<0.2	<0.05	
		MUSCLE	5.1	1.1	0.20	0.04	<0.01	0.18	0.07	0.15	0.04	<0.05	<0.05	
	WHITE SUCKER	LIVER	16	2	6.8	3.2	0.05	0.04	0.07	0.05	0.90	0.06	<0.2	<0.05
		MUSCLE	3.9	2.2	0.42	0.13	<0.01	0.05	0.05	0.16	0.03	<0.05	<0.05	
SASK LAKE NO.2	NORTHERN PIKE	LIVER	61	11	25.4	21.3	0.24	0.18	0.74	0.68	1.67	0.43	<0.2	<0.05
		MUSCLE	5.8	1.8	0.20	0.06	<0.01	0.63	0.37	0.39	0.05	<0.05	<0.05	
	NORTHERN PIKE	LIVER	95	26	10.5	5.9	0.17	0.08	0.56	0.55	1.69	0.37	<0.2	<0.05
		MUSCLE	6.2	1.3	0.27	0.06	<0.01	0.52	0.26	0.35	0.03	<0.05	<0.05	
SASK LAKE NO.3	WHITE SUCKER	LIVER	24	1	6.5	2.3	0.17	0.08	0.05	0.01	0.81	0.17	*	<0.05
		MUSCLE	3.3	0.5	0.33	0.03	<0.01	0.11	0.02	0.29	0.03	<0.05	<0.05	
	NORTHERN PIKE	LIVER	47	13	29.1	12.8	0.78	0.34	0.44	0.18	1.98	0.20	<0.2	<0.05
		MUSCLE	5.6	1.5	0.19	0.03	<0.01	0.29	0.05	0.26	0.04	<0.05	0.05	
SASK LAKE NO.4	WHITE SUCKER	LIVER	25	4	18.9	6.0	0.29	0.09	0.07	0.03	0.97	0.20	<0.2	<0.05
		MUSCLE	3.1	0.6	0.27	0.06	<0.01	0.12	0.08	0.33	0.07	<0.05	<0.05	

* no data available.

Note- For calculation of means, results reported as less than detection limit were set to 0.5 of detection limit.